

MRT

MOTOROLA RADIO TECHNOLOGY

Technical information for private, trunked and public safety networks.

AUGUST 2000

SLASH!

**THE WOLVERINE STATE
SCRAPS ITS RADIO SYSTEM
IN FAVOR OF P25 DIGITAL**

Vertex--For Business, Industry, and Public Safety.

Vertex Radio Communications, the land mobile division of Yaesu, has been at the forefront of high-tech engineering and quality manufacturing for over 40 years. Always keeping customer satisfaction as their goal, the Vertex line meets the ever-growing demands of private sector, public safety, and governmental organizations.

The Vertex full line of wireless radio equipment is compatible with commercial specifications worldwide, and includes a wide variety of portable, compact/mobile base stations, HF/SSB transceivers,

repeaters, and trunking systems.

Incorporating constant customer feedback with break-through design in synthesized radio communication technology has resulted in innovative products like the FTH-2070 32 Channel 5W Dual Band VHF/UHF Portable radio introduced in 1988. This unequaled radio gained immediate acceptance for its ability to link public safety organizations in time of crisis, and remains unique to Vertex today.

Now, with its expanded line--including the ultra-compact VX-10, 40 and 102 Channel

VHF/UHF Portables -- Vertex Radio Communications provides solutions to communication needs for business, industry, and public safety.

For more information about the complete line of Vertex Radio Communications products, see your authorized Vertex dealer, or call:

562-404-2700



vertex
RADIO COMMUNICATIONS
Land Mobile Division of Yaesu U.S.A.



United States & Canada: Yaesu U.S.A., (562)404-2700

©1998 Yaesu USA. Specifications subject to change without notice

Circle (1) on Fast Fact Card

The Washington State DOT goes everywhere, does everything.

No wonder they chose a Multi-Net® II communications system.

THE SYSTEM AT A GLANCE

- 800 MHz Multi-Net® II system operating on 39 channels through 125 repeater sites. More than 4,500 subscriber radios.
- Provides two-way radio communications for all WSDOT operations throughout the State of Washington.
- Serves a variety of applications, such as 24-hour incident response units, highway maintenance crews, snowplows, statewide emergency management, traffic management in Seattle and Tacoma, and ferryboat operations on Puget Sound.
- Operates across diverse terrain and conditions: seacoast, rain forest and mountains in the west, semi-arid grasslands and canyons in the east.
- Dispatch consoles in Seattle and Tacoma; other regions use either dispatch consoles or area control stations.



Grass Mountain is one of 125 WSDOT repeater sites that cover the state. The Washington State Patrol owns the site and shares it with WSDOT.



The 24-hour Incident Response units depend on the radio system for reliable communications as they handle all kinds of emergencies.



The WSDOT radio system covers ferryboat operations, where it's invaluable for loading and unloading thousands of cars per day.



More than 350,000 vehicles travel Seattle freeways each day. The Traffic Systems Management Center (TSMC) communicates with incident response units, tow trucks, traffic engineers, and WSDOT crews to help ensure a smooth traffic flow.

Multi-Net® II:
The System of Choice for Public Safety



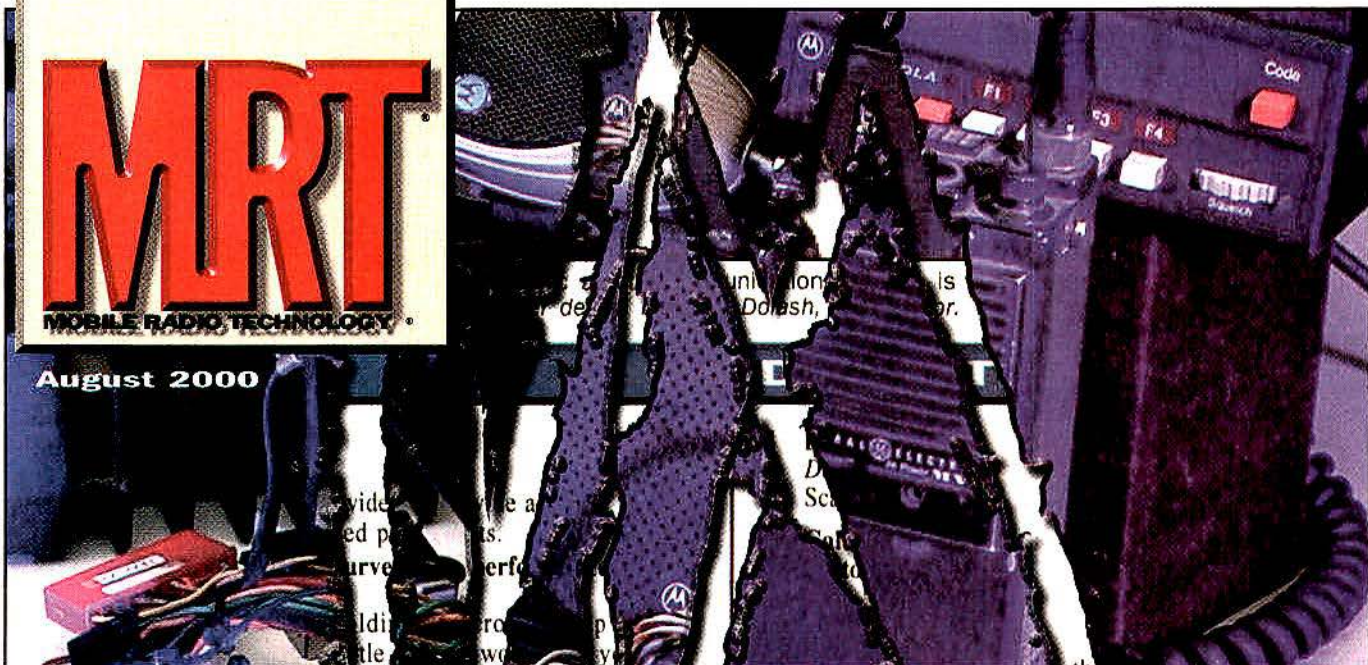
299 Johnson Ave., Waseca, Minnesota 56093
Fax 507-835-8356 • www.efjohnson.com

1-800-621-2945

MRT

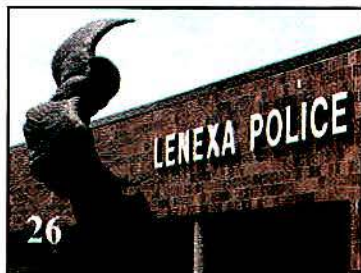
MOBILE RADIO TECHNOLOGY

August 2000



On the cover: Michigan's new Project 25-compliant, public safety communications system is close to going online, which means the original system can be sold for scrap. See the story on page 34. Cover design by Scott Dolash, art director.

FEATURES



- 26 The longest day**
Nikki Chandler and D.A. Keckler
A case study of how public safety dispatchers and patrol officers interact with mobile radio communications to 'protect and serve.'



- 34 Joining forces**
Matthew Halverson
The efforts of the state of Michigan and Motorola to create the first Project 25-compliant radio system means users really will be 'calling all cars.'

- 50 Fire vehicle installation**
Donald E. Koehler
Radio installations in specialty firefighting vehicles are challenging enough, but this one is a real hummer.



- 54 Putting Project 25 to the test**
Bill Burrows
To take advantage of multiple sourcing under an open standard, public safety systems operators and technicians will require broader testing capabilities.

- 58 APCO pre-show**

- 60 Intergovernmental planning creates public safety 'radio utility'**
John Brown and Frederick G. Griffin
Spotsylvania County, VA, applies infrastructure planning to create an 800MHz radio system with long-term benefits.

DEPARTMENTS

- 4 Editorial**
Don Bishop
Scanning...
- 8 Calendar**
Editorial index
- 10 Editorial forum**
D.A. Keckler
Fashion statement: Lose the weight
- 12 In the public interest**
Robert H. Schwaninger Jr.
Zero to 700 and back
- 16 Public safety: 10-2**
David O. Dunford
APCO: What's in it for me?
- 18 Technically speaking**
Harold Kinley, C.E.T.
Antenna-testing methods
- 63 News**
AMTA works with SiteSafe on ATA frequency
- 67 Product focus: Mobile radios**
- 68 Products**
Readers' choice: Headset
- 74 People**
- 75 Classified**
- 88 Ad index**

3 Great Products

for *Public Safety*

Applications

TOWER-MOUNTED PREAMPLIFIER

The new 423-Series brings economy with uncompromised performance to TX RX Systems' family of dependable tower-mounted preamplifiers. Model 423-86A-01-03 is designed specifically for use with Public Safety frequencies in the NPSPAC band.

Model 423-86A-01-03

Pass Bandwidth: 821-824 MHz

Isolation @ 825 MHz: 35 dB

Gain: 14-15 dB

System Noise Figure: 3.0 dB

3rd O.I.P.: +40 dBm

Weight: 22 lbs.

DUPLEXER

Vari-Notch®, the trademark for TX RX Systems' pseudo bandpass circuit design, offers the best cost-to-performance ratio in its class. Model 28-37-02A has been around for nearly 20 years. Its sound design, rugged construction, and long-term dependability make it an excellent choice for Public Safety applications.

Model 28-37-02A

Frequency Range: 144-174 MHz

Min. Freq Separation: 500 kHz

Insertion Loss: 1.5 dB

Isolation: 85 dB

Max. Power: 400 Watts

REPEATER AMPLIFIER (aka Signal Booster)

These amplifiers are used to extend radio coverage into areas such as convention centers, prisons, shopping centers, subways, and airports. Models are available with various gains, pass bandwidths, enclosures, supervisory and backup features. Model 61-89A-06-OLC-G2 is a popular choice for use in the NPSPAC BAND.

Model 61-89A-06-OLC-G2

Pass Bands: 821-824 & 866-869 MHz

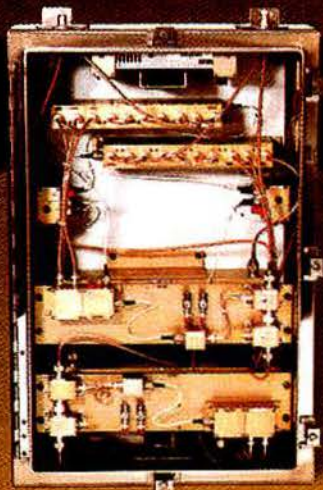
Gain: +83 dB (typical)

3rd O.I.P.: +44 dBm (typical)

Output Level Control: 35-40 dB

Enclosure Type: Stainless Steel NEMA 4X

TXRX is proud to provide coverage at the 66th APCO International Conference & Expo. Stop by and visit our booth #1510!



FCC ID EZZ5PI901211



8625 Industrial Parkway
Angola, NY 14006
Ph: 716-549-4700
FAX: 716-549-4772
Email: sales@txrx.com

DUPLEXERS • CAVITY FILTERS • MULTICOUPLER SYSTEMS • SIGNAL BOOSTER SYSTEMS • RF SYSTEM PRODUCTS

A member of Bird Technologies Group

Circle (5) on Fast Fact Card

Scanning ...

A voice for TETRA

Mark A. Hoppe, the interim chairman of the North America TETRA Forum (NATF), heads an organization that was formed to meet the needs of what he described as the growing interest in TETRA digital radio communications technologies among business, industrial, utility and public safety users.

"At the core of NATF is the belief that customers, rather than manufacturers, best understand their particular needs and should have the freedom to choose the technology most suited to their specific situation," Hoppe said.

Since 1997, Hoppe has offered consulting services to the wireless industry, working for St. Paul, MN-based Blue Wing. From 1994 to 1997, he was a systems engineer, product manager and market manager for E. F. Johnson.

NATF wants to clear away any restrictions that may prevent TETRA equipment sales in North America. The TETRA Memorandum of Understanding (MoU) governs intellectual property rights (IPR). The MoU requires any signatory to make its applicable IPR available to any other signatory. What's stopping TETRA from being offered in North America? Some manufacturers fear litigation.

Motorola, a signatory to the MoU, is taking the view that its IPR would be violated by any organization that might sell TETRA equipment here. In Motorola's opinion, the MoU only applies outside of North America. Although other MoU signatories do not share that view, for now they seem unwilling to risk shipping equipment into North America. Meanwhile, Motorola sells TETRA equipment overseas and could sell it here if it wanted to, because other IPR holders want to cooperate. Motorola believes it *should* stand in the way, though, saying that its resolve is based on its assessment of desires of its public safety radio users. Skeptics say that Motorola's resolve is based on its dominance of U.S. digital public safety technology and the higher price for that technology compared to the European price for TETRA equipment.

NATF's position is that it wants TETRA to be available as a choice for all users, and not necessarily public safety only.

Motorola has offered its IPR "if and

when" TETRA is adopted as a North American standard—if the American National Standards Institute or the Telecommunications Industry Association adopts it, for example. The European Telecommunications Standards Institute (ETSI) has adopted Tetra as a standard.

In the United States and Canada, many companies sell radio communications equipment that include technologies not part of North American standards, includ-



ing Logic Trunked Radio (LTR), SmartNet, digital channel multicarrier architecture (DCMA) and integrated digital enhanced network (IDEN). It isn't necessarily contrary to users' interests when manufacturers offer equipment without regard to a standard.

Our take on NATF is that it will give prospective TETRA users a venue for demonstrating the extent of their interest in the technology. If enough of Motorola's customers participate in NATF and want TETRA, maybe the company will relent and allow use of its IPR without the hurdle of the standards process.

NATF might just give its user members the voice they need to get the TETRA choice—if they want it.

NATF will sponsor "TETRA 2000 Workshop and P25 Phase II TDMA Update" in Boston on Aug. 18. Information is available at www.tetraforum.org.

Nextel

At press time, news began emerging about racial and sexual discrimination allegations against Nextel Communications, McLean, VA. Neither Nextel nor Leeds Morelli & Brown (LMB), the law firm representing complainants, returned

our calls, but the Reuters news service has described the allegations and Nextel has posted a statement on its Web site.

The news service reported that as many as 300 employees plan to file complaints.

Jeffrey Brown, a partner at LMB, is quoted as saying that a financial settlement is sought that would exceed the amount paid by Texaco in 1996 to settle a racial bias case. Texaco agreed to pay \$176 million over five years. Brown also said that LMB wants Nextel to commit more than \$2 billion toward diversity programs.

In its statement, Nextel declined to comment on any specific allegations until all the relevant facts are gathered and assessed. "We will conduct a thorough investigation of those allegations once we have received the information we need to do so," the statement reads.

Nextel continues to build its network. Construction costs contributed to company expenses of \$1.5 billion against sales of \$3.3 billion last year.

The action by LMB places a huge question mark on Nextel's financial future. Nextel's wireless telephone network has previously attracted investment and possible acquisition attention from wireline carrier MCI. Since then, WorldCom bought MCI. WorldCom inked a merger deal with Sprint that would bring it Sprint's national PCS wireless telephone network in the bargain. That merger started looking doubtful about the time the discrimination allegations surfaced. While WorldCom might otherwise look anew at Nextel to gain a national U.S. wireless telephone network, it may not want to buy legal troubles of this type.

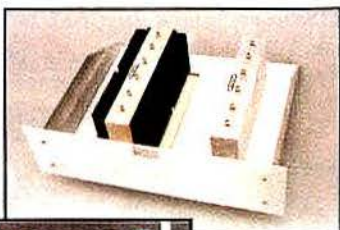
Now that the Sprint merger has unraveled, WorldCom may turn its attention to European acquisitions and leave the matter of a U.S. wireless network for another time. Nextel's management seems inclined to defend the company against the allegations. Yet, if Nextel suddenly settles and announces a deal to be acquired by WorldCom, the wheel of cash will have spun faster than the wheels of justice can.

Don Bishop

Editorial Director
don_bishop@intertec.com

"COMING THROUGH LOUD AND CLEAR"

- Wattmeters
- Combiners
- Duplexers
- Antennas
- Filters
- And more



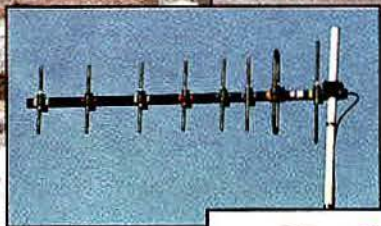
Telewave, Inc. delivers
high performance
everytime, everywhere.



We bring **26 years** of product
and system design experience
to the table for every customer,
large or small, worldwide.



With a full line of standard
products, and custom designs
available for special projects,
our support of **Public Safety**,
Government, and Business
systems is second to none.



Contact Telewave today at
1-800-331-3396 and discuss
your system requirements
with our sales engineers.
Or visit our website at
www.telewave.com

Telewave, Inc.
1155 Terra Bella Avenue
Mountain View, CA 94043
email: sales@telewave.com



TELEWAVE, INC.

Wireless Communications Manufacturers Since 1972

Visit us at APCO, Booth #2927.

Circle (6) on Fast Fact Card

FEATURES: Location technologies; Wireless@Work; inside the FCC's O.E.T.; noise reduction.

PLUS: Robert H. Schwaninger Jr.'s "In the Public Interest"; Harold Kinley's "Technically Speaking"; David Dunford's "Public Safety: '10-2'"; editorial commentary from Don Bishop and Matthew Halverson; Product focus—what's new in antennas for portables.

AND IN THE MONTHS TO COME:

UHF trunking; mobile antennas; installation and maintenance; test shielding; field testing equipment; Buyers' Guide.



Visit us
on the web at
www.mrtmag.com

EDITORIAL

Don Bishop, *Editorial Director*
David Keckler, *Technical Editor*
Nikki Chandler, *Senior Associate Editor*
Matthew Halverson, *Associate Editor*
Harold Kinley, C.E.T., *Contributing Editor*
Donald E. Koehler, *Contributing Editor*
Patrick Buller, *Contributing Editor*

EDITORIAL ADVISORY BOARD

John Abbey, *The Abbey Group*
Elliott Hamilton, *The Strategis Group*
Rich Bibb, *Bibb Engineering*
Alan Burton, *founder, Dispatch Monthly magazine*
Gene A. Buzzi, *Omnicom Telecommunications Engineering*
Jack Daniel, *The Jack Daniel Company*
Gary David Gray, P.E., *Orange County Communications*
Frederick G. Griffin, P.E., *Frederick G. Griffin P.C.*
Jim Hendershot, *Radio Design Group*
Samuel J. Klein, *Cellular Design*
S.R. McConoughey, P.E., *Mobile Communications Consulting*
Art McDole, *Salinas, CA*
Tony Sabino, *Regional Communications*
Robert C. Shapiro, P.E., *Strategic Telecommunications*
Leon Spencer, *Exxon Computing Services Services*
Gregory M. Stone, Ph.D., *Quantum Radionics*
Raymond C. Trott, P.E., *Trott Communications Group*
William A. Wickline, P.E., *Mentor, OH*

PUBLIC SAFETY CONSULTANT

David O. Dunford, *Lenexa, KS, Police Department*

REGULATORY CONSULTANT

Robert H. Schwaninger Jr., *Schwaninger & Associates, Washington, DC*

DESIGN

Scott Dolash, *Art Director*

BUSINESS

Larry Lannon, *Vice President, Communications Division*
Mercy Contreras, *Group Publisher*
Patricia Kowalczyk, *Director of Marketing*
Catherine Larkin, *Senior Promotions Coordinator*
Karen Clark, *Marketing Coordinator*
Melissa Langstaff, *Ad Production Coordinator*
Nancy Hupp, *Director, Corporate Ad Services*
Kristi Woods, *Classified Advertising Coordinator*
Tom Cook, *Director of Editorial Development*
Doug Coonrod, *Corporate Creative Director*
Sheri Gronli, *Corporate Circulation Director*
John Huffman, *Senior Circulation Manager*
Customer Service, 800-441-0294 or 913-341-0294
Cameron Bishop, *President & CEO*
Ron Wall, *Chief Operating Officer*
PRIMEDIA Business-to-Business Group
David G. Ferm, *President & CEO*
PRIMEDIA Inc.
Tom Rogers, *Chairman & CEO*
Charles McCurdy, *President*
Beverly C. Chell, *Vice Chairman*

CORRESPONDENCE: Editorial correspondence should be addressed to P.O. Box 12960, Overland Park, KS 66282-2960. tel. 913-341-1300; fax: 913-967-7250; mrt@intertec.com; www.mrtmag.com.

MOBILE RADIO TECHNOLOGY provides technical information to dealers; to private wireless, public safety, public service, community repeater, SMR, ESMR, paging, cellular and PCS system operators; mobile radio equipment manufacturers; manufacturers' representatives, distributors; engineering and consulting firms; national, state and local government and public safety agencies; transportation companies; petroleum and energy products companies; public utilities; and others allied to the field.

PHOTOCOPY RIGHTS: Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Intertec Publishing, provided that the base fee of US \$2.25 per copy, plus US \$0.00 per page is paid directly to Copyright Clearance Center, 222 Rosewood Dr., Danvers, MA 01923, USA. The fee code for users of the Transaction Reporting Service is 0745-7626/2000 \$2.25 + \$0.00. For those organizations that have been granted a photocopying license by CCC, a separate system of payment has been arranged. Prior to photocopying items for educational use, please contact CCC at 978-750-8400. Organizations or individuals with large quantity photocopy or reprint requirements should contact Jenny Eisele, 913-967-1966 or email: jenny_eisele@intertec.com.

BACK ISSUES: Copies of most issues printed within the past two years are available for \$10 per issue; older issues are not. Call customer service at 800-441-0294.

Intertec Publishing makes portions of our magazine subscriber lists available to carefully screened companies that offer products and services directly related to the industries we cover. Any subscriber who does not want to receive mailings from third-party companies should contact the Intertec subscriber service department at 800-441-0294 (US), 913-967-1707 (outside US).

This publication is available via microform and/or electronic databases from Bell & Howell Information and Learning, 300 N. Zeeb Road, P.O. Box 1346, Ann Arbor, MI 48106-1346. Contact Bell & Howell at 800-521-0600 (734-761-4700 outside North America) or check the Web site (www.umi.com) for additional information on format availability.

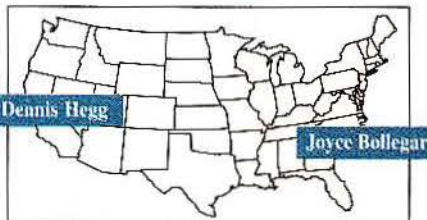
Audited circulation.



ADVERTISING SALES OFFICES

OVERLAND PARK, KANSAS

Joyce Bollegar, 913-967-1840.
East Region (including Eastern Canada)
Fax: 913-967-7249
Email: joyce_bollegar@intertec.com
Dawn Rhoden, *Classifieds*,
913-967-1861, Fax: 913-967-1735
Email: dawn_rhoden@intertec.com
Lori Christie, *List Rental Services Representative*,
913-967-1875, Fax: 913-967-1897
Email: lori_christie@intertec.com
9800 Metcalf Avenue
Overland Park, KS 66212-2215



SANTA ROSA, CALIFORNIA

Dennis Hegg, *West region (including Alaska, Hawaii and Western Canada)*
Phone: 707-541-3763, Fax: 707-541-3721
Email: dennis_hegg@intertec.com
3428 Mendocino Ave.
Santa Rosa, CA 95403

ENGLEWOOD, COLORADO

Mercy Contreras, *Group Publisher*
Phone: 720-489-3199
Fax: 720-489-3253
Email: mercy_contreras@intertec.com
5680 Greenwood Plaza Blvd., Suite 100
Englewood, CO 80111

LONDON

Stephen Bell, *International*
Phone: +44 208 286 8889
Fax: +44 208 286 8898
Email: stephenbell@email.msn.com
P.O. Box 98
Worcester Park, Surrey, KT4 8WB
United Kingdom



9 Autry Irvine, CA 92618
(949) 458-7277 • (949) 458-0826



...POWER ON WITH ASTRON

SWITCHING POWER SUPPLIES...



MODEL SS-10TK



MODEL SS-121F



MODEL SS-18



MODEL SS-25M



MODEL SRM-30



MODEL SRM-30M-2



MODEL SS-12SM/GTX



MODEL SS-IDEFJ-98

SPECIAL FEATURES:

- HIGH EFFICIENCY SWITCHING TECHNOLOGY SPECIFICALLY FILTERED FOR USE WITH COMMUNICATIONS EQUIPMENT, FOR ALL FREQUENCIES INCLUDING HF
- HEAVY DUTY DESIGN
- LOW PROFILE, LIGHT WEIGHT PACKAGE
- EMI FILTER
- MEETS FCC CLASS B

PROTECTION FEATURES:

- CURRENT LIMITING
- OVERVOLTAGE PROTECTION
- FUSE PROTECTION
- OVER TEMPERATURE SHUTDOWN

SPECIFICATIONS:

INPUT VOLTAGE: 115 VAC 50/60HZ
OR 220 VAC 50/60HZ
SWITCH SELECTABLE
OUTPUT VOLTAGE: 13.8VDC

AVAILABLE WITH THE FOLLOWING APPROVALS: UL, CUL, CE, TUV.

DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1 1/2 x 6 x 9	3.2
SS-12	10	12	1 1/2 x 6 x 9	3.4
SS-18	15	18	1 1/2 x 6 x 9	3.6
SS-25	20	25	2 1/2 x 7 x 9 1/2	4.2
SS-30	25	30	3 1/2 x 7 x 9 1/2	5.0

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2 1/2 x 7 x 9 1/2	4.2
SS-30M*	25	30	3 1/2 x 7 x 9 1/2	5.0

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3 1/2 x 19 x 9 1/2	6.5
SRM-30	25	30	3 1/2 x 19 x 9 1/2	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3 1/2 x 19 x 9 1/2	6.5
SRM-30	25	30	3 1/2 x 19 x 9 1/2	7.0

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25A-2	20	25	3 1/2 x 19 x 9 1/2	10.5
SRM-30A-2	25	30	3 1/2 x 19 x 9 1/2	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3 1/2 x 19 x 9 1/2	10.5
SRM-30M-2	25	30	3 1/2 x 19 x 9 1/2	11.0

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F1020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

2000

August

13-17: Association of Public-Safety Communications Officials—International (APCO) National Conference, Boston. Contact: 904-322-2500 or www.apco2000.org.

September

18-20: TAP Engineering Seminar, sponsored by Softwright, Holiday Inn Southeast, Aurora, CO. Contact: 303-344-5486.

19-22: Fall Vehicular Technology Conference, sponsored by IEEE Vehicular Technology Society, Seaport Hotel, Boston. Contact: 904-322-2500.

26-29: PCIA GlobalXChange, sponsored by PCIA, McCormick Place, Chicago. Contact: 703-739-0300 or www.pcs00.com.

28-29: SBT Fall Conference, Ritz Carlton Hotel, St. Louis. Contact: 520-836-2025.

October

4-7: Private Wireless Spectrum Management Conference, sponsored by the Industrial Telecommunications Association, the Council of Independent Communication Suppliers and USMSS, Grand Hyatt Hotel, Washington. Contact: Ray Wisniewski, 703-797-5123.

15-17: ENTELEC & UTC Joint 2000 Fall Seminar, sponsored by ENTELEC and UTC, Houston. Contact: 888-503-8700 or email entelec@pdq.net.

23-25: AMTEX, sponsored by the American Mobile Telecommunications Association, Embassy Suites Outdoor World, Dallas. Contact: 202-331-7773 or www.amtausa.org.

29-Nov.1: Tower Summit, sponsored by Shorecliff Communications, The Paris Hotel, Las Vegas. Contact: 888-662-6021.

November

5-7: Utilities Telecom Summit, sponsored by UTC, the United Telecom Council, Sheraton Bel Harbour, Miami Beach, FL. Contact: 202-872-0030 or www.utc.org.

12-15: Telecommunications Resellers Association Fall Conference and Exhibition, sponsored by TRA, Anaheim, CA. Contact: 202-835-9898 or www.tra.org.

15-18: Communications Marketing Conference, sponsored by the Communications Marketing Association, Sheraton Colony Square, Atlanta. Contact: 404-892-2600, ext. 300 or www.commktga.com.

17: Radio Club of America Communications Symposium, 92nd Anniversary Dinner and Awards Presentation, New York Athletic Club, New York. Contact: Gerri Hopkins, 732-842-5070.

2001

January

6-9: International CES, sponsored by the Consumer Electronics Manufacturers' Association; Las Vegas Convention Center, Las Vegas Hilton, Riviera Hotel and Alexis Park Hotel, Las Vegas. Contact: www.CESweb.org.

February

20-23: NATE, sponsored by the National Association of Tower Erectors, Adam's Mark Hotel, Dallas. Contact: 888-882-5865 or www.natehome.com.

March

20-22: Wireless, sponsored by the Cellular Telecommunications Industry Association, Las Vegas. Contact: 202-785-2842 or www.wow-com.com.

28-30: International Wireless Communications Expo, sponsored by *Mobile Radio Technology*, Las Vegas Convention Center, Las Vegas. Contact: Web site www.iwceconexpo.com.

April

1-4: ENTELEC, sponsored by ENTELEC, New Orleans. Contact: 281-357-8700 or Web site www.entelec.org.

May

21-24: Telecommunications Resellers Association Spring Conference and Exhibition, sponsored by TRA, Adam's Mark Hotel, Dallas. Contact: Web site www.tra.org.

June

3-7: Supercomm, sponsored by TIA and USTA, Georgia World Congress Center, Atlanta. Contact: 800-278-7372.

24-27: UTC Telecom, sponsored by UTC, The United Telecom Council, Midwest Express, Milwaukee. Contact: 202-857-1881 or www.utc.org.

24-28: NENA, sponsored by the National Emergency Number Association, Orlando, FL. Contact: Web site www.nena9-1-1.org.

November

6-8: Canadian Wireless, sponsored by the Canadian Wireless Telecommunications Association, Metro Toronto Convention Center, Toronto. Contact: 613-233-4888, ext. 102, or www.cwta.ca.

August

5-9: Association of Public-Safety Communications Officials—International (APCO) National Conference, Salt Lake City. Contact: 904-322-2500 or www.apco-intl.org.

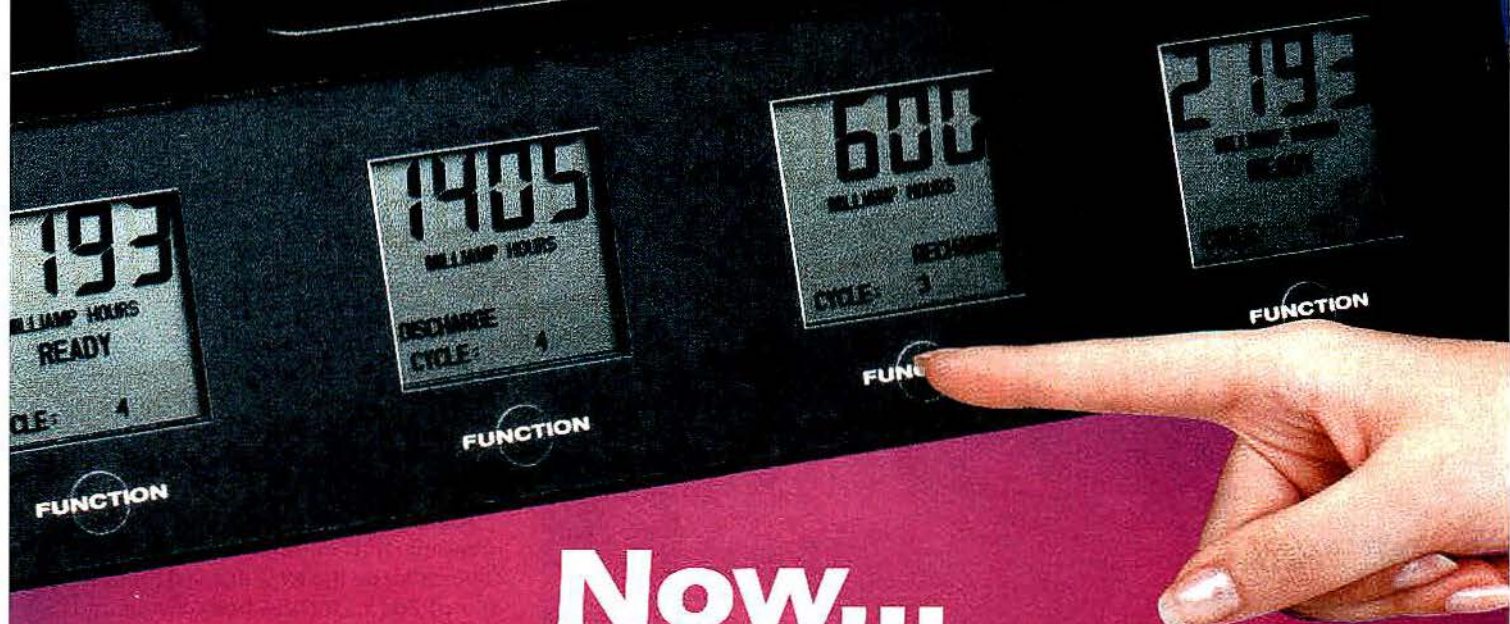
EDITORIAL INDEX

A.C. Simmonds & Sons	64
ACOM Business Unit	65
American Tower	74
Amrel	69
Astron Antennas	71
AT&T	46
Biby Engineering Services	63
Blue Wing	4
Cadex Electronics	70
CeoTronics	68
Cerulean	64, 65
Citizen	29
Com-Net Ericsson	
Critical Radio Systems	65, 67
Danko	51
Dataradio	65
DCS Electronics	64
Decibel Products	70
Dell	29
E.F. Johnson	4, 64
Evolution Audio	64
Federal Signal	29
Femme Comp	66

Fibrebond	64
Global Dispatch Technology	64
HTE	65
IBM	28
IFR Systems	57, 73
Independent Wireless One	74
Itronix	64
JBro Batteries	74
JPS Communications	68
Kenwood Communications	67
King Communications	67, 73
Kustom Signals	29
Lightbridge	74
MCI	4
Metrocall	74
Motorola	4, 29, 34, 51, 64, 65, 67, 73, 74
MCT	29
Multiplier	69
Nextel Communications	4, 12, 29, 63
Nokia	29
Orbacom Systems	28, 65
Palm Pilot	29
Panasonic	73

Plant Equipment	65
Plessey Asia Pacific	65
Positron	64, 70
Racal	64, 71
Radio Frequency Systems	74
Relm Wireless	66
RF Connectors	71
Sabre Communications	74
Silver Eagle	47
Simmonds Capital	64, 66
SiteSafe	63
Sprint	4
TeleStatus	64
Times Microwave Systems	69
TransTech System	65
Uniden America	29, 66
Vision Software	64
Widcomm	74
Wood & Douglas	74
WorldCom	4
Zetron	28, 65

It's a "NO BRAINER" Battery Analyzer & Conditioner



Now... at your fingertip!

Easy-To-Use... "Just one Button" gives you access to the most technically advanced and affordable analyzer/conditioner on the market today!

The Analyzer I, III & VI Series has standard features not found on other systems costing over three times as much...including:

- Charges & analyzes Nickel-Cadmium, Nickel Metal Hydride, Lead Acid & certain Lithium Ion chemistries.
- Single button operation.
- Four independent charge rates.
- Eight independent discharge rates.
- Computer compatible.
- Interchangeable adapter cups.
- UL, CSA & CE approved.

Call for our comprehensive detailed catalog



WHERE QUALITY IS #1

W&W Manufacturing Co.

800 South Broadway, Hicksville, NY 11801

In U.S. & Canada 800-221-0732 • In NY 516-942-0011 Fax 516-942-1944
E-Mail: w-wassoc@ix.netcom.com • Web Site: <http://www.wwassociates.com>

W&W Europe B.V. Phone: +31(0) 172-417072 • Fax: +31(0) 172-417080

Circle (8) on Fast Fact Card



Fashion statement: Lose the weight

In June the *Boston Globe* extolled how clothing designers' fall lines will be replete not only with pleats but with a plethora of pockets. These pockets will be tailored for assorted personal wireless devices: pagers, cell-phones, radios, PDAs and portable CD players. Rather than disguising this electronic armory, the fashions will make the pouch the focal point. Some garments will even connect to the devices and glow or strobe—sort of a wearable GUI, announcing an incoming page, call or email. (*Not in the theaters, please.*)

I remember a similar fashion forecast in 1970. *Life* magazine commissioned fashion guru Rudi Gernreich (Remember the topless swimsuit?) to forecast '70s wardrobes. Gernreich's unisex look seems hopelessly silly now, but some of his predictions were dead-on, such as pastel hair, vanity colored contact lenses and "a combination wristwatch, weather indicator, compass and *radio*" incorporated into a wristband. (And not a cell site in sight, yet.)

For decades, the wearing of a tie to work or meetings signaled status, rank or importance within the organization. Women were left to their own devices, but now *electronic* devices make business a little more egalitarian. The visibility or flourishing of a cellphone has arguably replaced the suit-and-tie as a token of how important you are (or think you are). It says that you must be available "24-7" because of what you know or what indispensable service you provide.

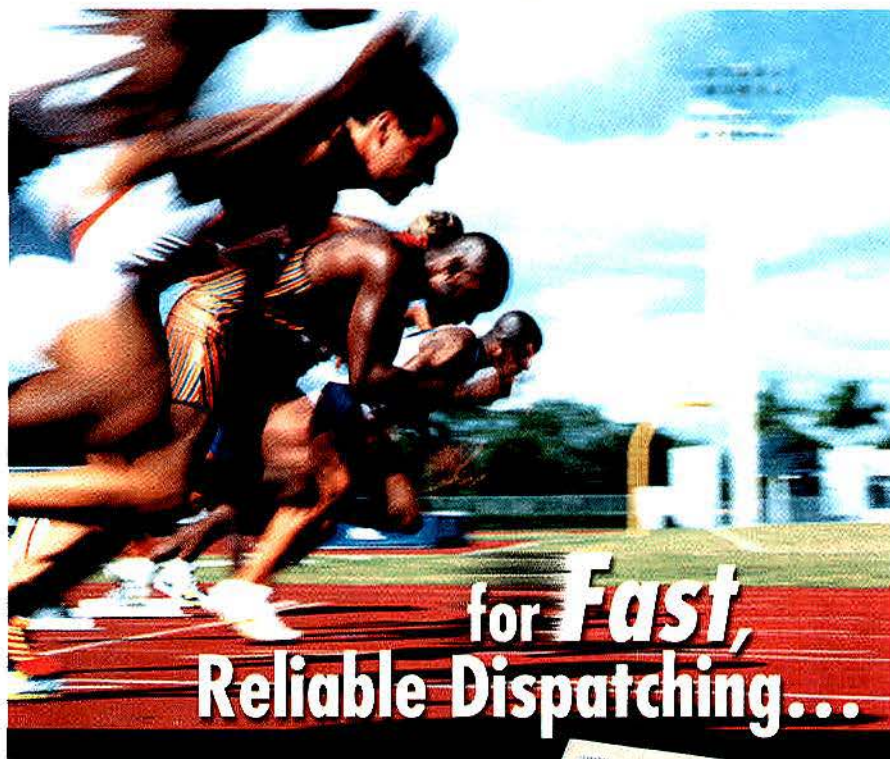
Another recent fashion article is a bit more martial: *Popular Science*'s July cover story on the well-dressed foot soldier of 2025. Besides body armor and wrist-mounted weapons pods, the prototype includes a full-face helmet with voice and data communications, night vision, 360° sensors, heads-up displays and video screened on the faceshield. Iron Man never had it this good.

Whether or not the army gets this gladiatorial gladrag, it would be great for *cops*. It would eliminate the dead weight and motion restraint associated with the utility-belt gizmos officers must carry: multiple handcuff sets, firearms, ammunition, a flashlight, a baton, keys, pepper spray and—lest we forget our side of the street—a portable radio, an epaulet mic, a wireless body mic and remote controls for audio, video and lightbar equipment on the patrol cruiser. Batman makes it look easy, but it takes a robust officer to run down a dark alley packing all that stuff. So, while we wait for clothing and uniform designers to trot out new wares, priorities in our industry should be miniaturization, weight reduction for portables and batteries, affordable ear-mics and vox controls. While we're waiting for the millennium monkey suits, let's get the monkey off the officer's back.

—D. A. Keckler
Technical Editor

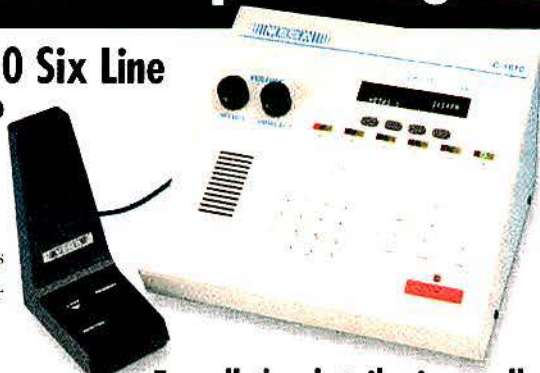
david_keckler@intertec.com

www.mrtmag.com



New Vega C-1610 Six Line Console with DSP Architecture.

- Dual sequential Tone Line Module cards for up to 6 lines
- Flexible line configuration for either a dedicated two- or four-wire full duplex circuit, or local control keying
- Vacuum florescent display
- Squelch and Line activity indicators flash upon detecting audio
- Optional desk microphone, headset, handset or gooseneck
- And much more!



For all the details, just call
1-800-752-7560

or fax (402) 467-3279
Email: vega_signal@earthlink.net
www.vega-signaling.com



TELEX Communications, Inc.

CIRCLE (9) ON FAST FACT CARD

Whether your system needs indoor or outdoor wireless testing... Berkeley has the solution!

Mongoose™

SIGNAL STRENGTH METER

For indoor sweeps by propagators.

- Internal memory stores signal strength
- Scans up to 21 channels
- Displays best 3 channels simultaneously
- Outputs data to a PC with a serial cable
- Audio can be heard through the headphones or internal speaker
- Includes rechargeable Ni-Cad battery/charger

INDOOR MICROCELL TEST EQUIPMENT

www.bvsystems.com/microcell

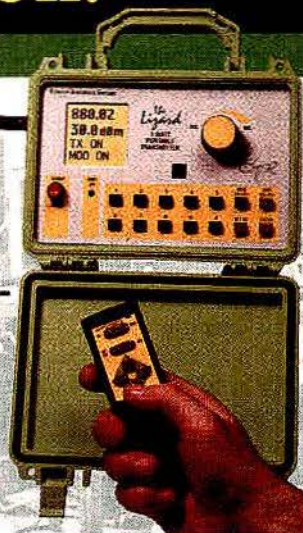


The Lizard™

1 WATT PORTABLE TRANSMITTER with REMOTE CONTROL

For indoor coverage testing.

- Dynamically adjustable power control from 1 milliwatt to 1 watt output
- Infrared remote control adjusts power output, frequency and on-off >25 feet
- Super bright 128 x 128 graphic LCD with backlight
- Battery operated



The Gator™

CLASS A TRANSMITTER SERIES

For measuring signal propagation, positioning antennas, setting power levels or validating coverage.

- Available in either 25 Watt Class A, or 45 Watt Class A (10 or 20 Watt Class A for PCS) FCC Type Accepted
- Built-in agile frequency synthesizer
- Power control in 0.1 dB increments
- Remote controllable
- VSWR antenna protection
- Weighs 25 pounds

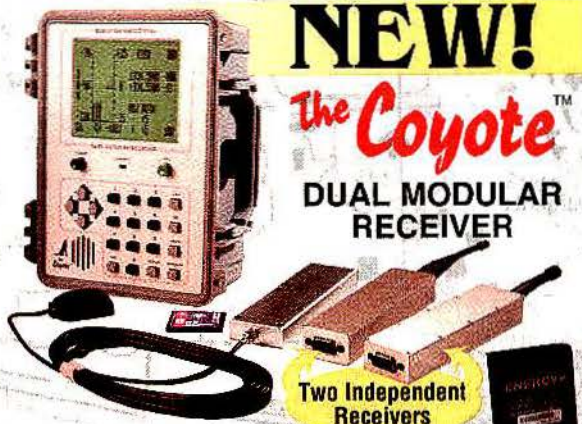
DRIVE-TEST AND WALK-ABOUT PROPAGATION ANALYSIS EQUIPMENT

www.bvsystems.com/drivetest

NEW!

The Coyote™

DUAL MODULAR RECEIVER



Two Independent Receivers

Measures RF propagation coverage and detects "RF Shadows".

- Dual modular receivers and 12-channel GPS allow users to swap various bands while in the field
- High measurement rate, more than twice that of Dr. Lee's recommended 40 λ plus distance averaging
- Removable, rechargeable Li-Ion battery system found on standard PC laptops
- Removable 8 MByte compact flash memory system for data storage and X/Y coordinate data
- Weighs only 7 pounds fully loaded with USB and Serial (RS-232) ports for high-speed connectivity to a PC

The Fox™



RUGGED HAND-HELD SIGNAL STRENGTH METER

Measures RF propagation coverage and detects "RF Shadows".

- High measurement rate, more than twice that of Dr. Lee's recommended 40 λ
- Internal eight channel differential GPS
- Removable PCMCIA memory system for post processing data import to a PC

Models Available:

- PAGING (POCSAG/FLEX)
- IS-136
- GSM
- LMR
- IDEN/SMR
- ETACS
- CELLULAR
- ISM
- PCS
- WCS
- IVDS

Custom frequencies available upon request.



BERKELEY VARITRONICS SYSTEMS

Liberty Corporate Park, 255 Liberty St., Metuchen, NJ 08840

Phone: 732-548-3737

www.bvsystems.com

Fax: 732-548-3404 • E-mail: info@bvsystems.com

Circle (10) on Fast Fact Card

Zero to 700 and back

By Robert H. Schwaninger Jr.

Everyone is excited about the availability of 700MHz channels. The band made available by the relocation of TV channels 60-69 is causing a great buzz throughout the industry as land mobile guys rub their collective hands together. But before the drool begins to pool, let's examine what conditions the FCC has created for the future use of this spectrum.

The present occupants of the band are TV broadcasters. For all of you who are unschooled in the way of politics, "TV broadcaster" is Washingtonian-speak for "sacred cow." So there won't be anyone moo-ing from those channels for a while. The votes simply aren't in Congress or within the FCC to make it happen.

Okay—one vote in Congress did get this migration moving. U.S. Sen. John McCain (R-AZ) was instrumental in establishing that broadcasters do not always walk on water, that the sun does not, in fact, rise and set only upon those persons who transmit *Laverne and Shirley*, and that sometimes, in a strange and wonderful world, the American public might indeed be served by telling the broadcasters to shut up.

It was this revelation regarding emperors and their transparent togs that caused the broadcasters to lose this band in the first place. Sen. McCain and other key congressional types thought that the spectrum could be better used for land mobile purposes—public safety, in particular. So, they took it away from the WB network wannabes and gave it to the fire and police and

Schwaninger, MRT's regulatory consultant, is the principal in the law firm of Schwaninger & Associates, Washington, which is counsel to Small Business in Telecommunications. Schwaninger is also a member of the Radio Club of America.

other public servants throughout the country. Or did they?

Oh sure, there was a clarion call and a "Huzzah!" as all gathered to see the transfer of power from broadcaster to burgomaster, but did that ceremony really mark the passing of title?

No.

It was mainly "show" and no "go."



Illustration by John Hayes

The broadcasters will leave the band, of course, but not until the year 2006 or until someone crosses their outstretched palms with millions in payola.

Now that's a public interest issue

The land mobile folks ran back to the FCC and asked the commission to create relocation rules to ease the recalcitrant broadcasters off the band prior to 2006 (or whenever). But the FCC is siding with the broadcasters on this one.

The commission said, in effect, the broadcasters can stay because the public interest would not be served by a forced relocation of the UPN folks onto alternative spectrum.

To put this into perspective, let's look over the FCC's relocation record:

□ When PCS came to market, the FCC decided that the public interest would be served by forced relocation of public safety licensees from the 2GHz microwave channels. That was OK because PCS had a superior right—a right that had been bought and paid for with billions of bucks to the U.S. Treasury. And besides, there was some nifty spectrum at 5.6GHz where the P.S. systems could go.

APCO didn't think that the FCC had done right by its members, and it appealed the FCC's relocation decision. The Court said, "Forget it APCO. If the FCC's got spectrum for your members to move onto, and PCS is willing to pay the freight, off you go." So, public safety was given a "Trail of Tears" to 5.6GHz, and PCS got the band.

□ The next relocation decision came at 800MHz, with the consolidation of the SMR marketplace by Nextel Communications. (There continues to be a case pending before the U.S. Court of Appeals brought by Small Business in Telecommunications regarding the upper-800MHz auction.) At the time, the FCC decided that it was more important for it and Nextel to violate the letter and spirit of 100 years of

antitrust legislation by forcing relocation than to allow local operators quiet enjoyment of their licensed systems. Oh yes, and the local operators' end users could also go to the devil. After all, it was in the public interest.

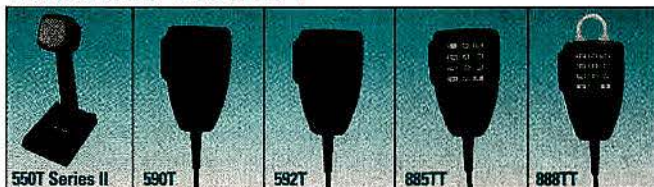
Now the FCC is "considering the public interest" by allowing broadcasters to hold up the same wheels of progress that rolled over local SMR operators. The FCC must consider whether the public needs the integrated use of

ALL THE RIGHT CONNECTIONS.



*Now compatible with
Motorola MCS-2000
and Midland Bantam radios!*

MODULINK® SYSTEM 1



550T Series II
Transistorized base station with split-bar monitor transmit switch

590T
Transistor amplified dynamic

592T
Electret condenser with noise-canceling pick-up

885TT
DTMF with continuous-tone dialing and illuminated keypad

888TT
Aircraft DTMF, noise-canceling and FAA certified

Shure ModuLink® handheld microphones connect easily to virtually all popular radio transceivers with no hardwiring. Simply snap the correct cordset into the ModuLink microphone and the transceiver. And in just 30 seconds, you're ready to roll.

ModuLink® saves service time, reduces downtime and inventory costs, as well as all the quality you've come to expect from Shure.

For more information on how you can make all the right connections with Shure ModuLink System 1, call 1-800-25-SHURE.

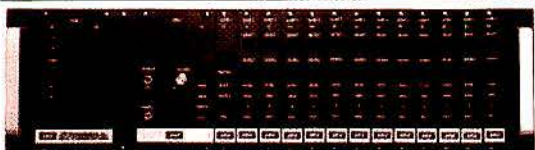
SHURE®

www.shure.com

Need Improved Portable Radio Coverage?

SNV-12

Add Receiver Voting and Transmitter Control with the SNV-12



- * DSP receiver voting improves portable radio talk-back.
- * Maximum 36 sites per channel.
- * Provides remote keying of transmitters, transmitter selection/steering, multicast and receiver grouping.
- * Console TX audio input with EIA Tone Remote decoding capability.
- * Adjustable audio delays to compensate for link paths tone keying-delays.
- * Receiver Voting for LTR Trunking.

For more information:
JPS Communications, Inc.
5720M Capital Blvd.
Raleigh, NC 27616
phone: (919) 790-1011
fax: (919) 790-1456
email: jps@jps.com
web: www.jps.com

**Come and Visit Us at APCO Conference & Expo
Booth #2411**



JPS Communications, Inc.

CIRCLE (12) ON FAST FACT CARD

telecommunications at 700MHz by fire, local government, police, road maintenance, transportation departments, county, state and city licensees. Or whether, on balance, the public would be better served by being able to see reruns of *Welcome Back, Kotter* before and after the *WWF Smackdown*.

Is the public better served by the use of 700MHz for local government, fire, police ... licensees, or by being able to see reruns of *Welcome Back, Kotter*?

Guess what? *Smackdown*'s got the power and the FCC is telling public safety and guardband managers to be patient—*real* patient. It's *only* five years, after all. And the broadcasters were there first, and the land mobile guys are going to get to use the spectrum for a long, long time, and

What's good for the goose...

Now, for all of you who have not been paying attention, let's recap what we have learned about the FCC's relocation policies:

- **Rule No. 1** — If you *pay* for the spectrum, the FCC is more likely to give eviction notices to the incumbent operators.
- **Rule No. 2** — If the incumbents are local operators or small municipalities, these incumbents are more likely to be tossed out than bigger companies.
- **Rule No. 3** — Public safety is *not* the same as public interest because public safety doesn't have to pay for spectrum.
- **Rule No. 4** — If relocation will cause the band to be held in the hands of fewer licensees, the FCC is more likely to allow forced relocation.
- **Rule No. 5** — If a *broadcaster* has it, we ain't takin' it away from them unless it's by gunpoint—and even then we need a large caliber.

Based on these simple rules, you can *guess* what the FCC will do the next time someone asks about relocation. Oh, go ahead—make your prediction. Amaze and delight friends at cocktail parties with your relocation acumen. Win a relocation pool in your office. The uses are endless for the guy or gal who has learned that when it comes to the federal government, think jaded ... jade ... green ... the color of money. Ahhhh.

Parts, services, and more

Minitor I parts

- ☒ Housings \$39
- ☒ Batteries \$4.50

Minitor II parts

- ☒ Housings \$24.50
- ☒ Battery door \$12
- ☒ Nylon case \$15
- ☒ Leather case \$59
- ☒ Batteries \$7.50
- ☒ Standard charger \$29.75

Minitor III parts

- ☒ Batteries \$3.00
- ☒ Nylon case \$15
- ☒ Standard charger \$39.75
- ☒ Charger w/audio \$129.75
- ☒ Vehicular charger \$119.75
- ☒ Programmer \$130
- ☒ Universal Interface \$210
- ☒ Minitor III pagers \$319 (VHF 1 channel only)



Minitor II repairs

- ☒ 5 day turn time
- ☒ 90 day warranty
- ☒ Low flat rates
- ☒ Frequency changes \$30

Tone filters/reeds

- ☒ Minitor I \$20 each
- ☒ Minitor II \$25 each
- ☒ In stock reeds/filters only

Portable radio batteries

- P100 \$36.75 (NTN5451)
- P110 \$62.75 (HNN8148)
- P200 \$39.75 (NTN5521)

Minitor II scan board

- ☒ Installed \$55 each
- ☒ Do it yourself kit \$50 each

Keynote monitor board

- ☒ Installed \$50 each

800-822-2180

Fax: 561-683-0059

1300 N FL Mango Rd #26
West Palm Beach, FL 33409



<http://www.pwservice.com>

Minitor & Keynote are a reg. trademark of Motorola

CIRCLE (13) ON FAST FACT CARD

INTRODUCING A 9-1-1 SYSTEM SO REVOLUTIONARY OUR COMPETITORS DON'T WANT YOU TO SEE IT.

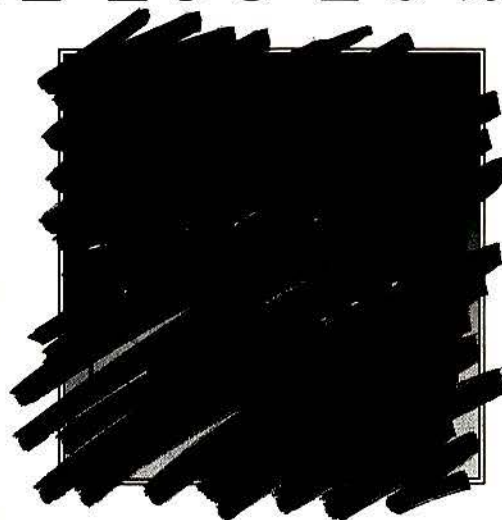
The revolution is here. Moducom is rewriting the book on 9-1-1 systems. And the competition can't compete.

9-1-1 AND RADIO DISPATCH IN A SINGLE SYSTEM.

The new UltraCom 2000™ is 9-1-1 and radio dispatch together, for the first time, in one single console system. Built by us from the ground up - not pieces of old proprietary technology - but a totally digital 32-bit Windows NT system. Telcordia and NENA compliant, handling both 9-1-1 and ADMIN lines.

A SINGLE SYSTEM MEANS LOWER COSTS.

9-1-1 and Radio dispatch in one system means lower initial costs than



two separate systems. If you choose to buy only one component of the system, either 9-1-1 or radio dispatch, you can add the other later and still save money.

You'll never pay for system program changes with our integrated system customizer. Trouble shooting time and costs are reduced with our built-in MEDIC diagnostics. And all software upgrades are always free and easily downloaded from the web.

A SINGLE SYSTEM FOR MAXIMUM FLEXIBILITY.

Fully programmable touch screens means you decide how your screens look based on how you work. For example: ALI and ANI windows can be brought up only when needed. A single, simple, set of tools allows you, not the factory, to make system changes. We can integrate our system easily with CAD and other applications.

Contact Moducom today to find out more about the 9-1-1 system our competitors would rather you not see.



**COST EFFECTIVE NOW.
MORE COST EFFECTIVE OVER TIME.**

DEMO OUR SINGLE SYSTEM SOFTWARE AT WWW.MODUCOM.COM OR 818-764-1333

MODULAR COMMUNICATION SYSTEMS, INC. 13309 SATICOY ST. NORTH HOLLYWOOD, CA 91605. E-MAIL: moducom@ix.netcom.com

To see what they don't want you to see, Visit us at APCO

Booth #1610, August 13-17.

Circle (14) on Fast Fact Card

APCO: No guilt by this association

By David O. Dunford

As introduced in an earlier column, Steve Davidson is the 9-1-1 center manager for the Lenexa, KS, Police Department. Steve isn't widely known by his first name, but readily answers to his moniker "Grumpy." Yes, that's right, the name fits the perceived behavior. But more importantly, Steve has a great coffee cup. Actually, it's just a regular coffee cup with a great saying inscribed on the side: "Everyone is Entitled to My Opinion." It seems like such a waste for "Grump" to proffer this opinion via a java jug when an opinionated curmudgeon, such as myself, could put it to real use.

Because August is the month for the APCO-International Conference and Exposition (and meeting, assembly, gathering, liars' contest, hoedown, and general bull session) in Boston, I'd like to offer my opinions about that esteemed outfit which, for years, has acted to shepherd along the interests of public safety communications.

In 1975, our local chapter asked a local fire chief to speak at one of the Kansas state APCO meetings. His one-hour presentation dealt with safety issues and hazards recently encountered in fighting petroleum fires. Apparently he thought our group was the "APCO" gasoline station franchise owners' meeting. It was only after he concluded his detailed, thoughtful and reflective speech that this gentleman mainstay of local public safety life was introduced to the "other" APCO. Likewise, while our state chapter has always had solid membership and good attendance at its two semi-annual meetings, we have regularly encountered the belief amongst Kansas sheriffs and local chiefs of police that APCO stands for Alcohol Program for Communications Officers (Well, at least in Kansas, that was the popular belief).

Unknown by most people, APCO has played a significant role in the evolution and deployment of communications systems in the public safety marketplace for system administrators and Radiomen alike. After all, this outfit originated in an era when "dispatchers" (now called *communications specialists*, *telecommunicators* or even *system*

status controllers) were necessarily technical types because these were the only people who had the knowledge and skill to actually operate the radio equipment. (Note: Does the introduction of CB radios indicate technical evolution, or devolution?) Partly because of its



members' technical expertise, APCO acted as the official "designated entity" to represent law enforcement and local government in matters before the FCC, and until fairly recently, APCO focused its annual conferences on technical subject matter aimed squarely at Radioman.

But, like the technology it helps develop, APCO has undergone major organizational changes in recent years. Adoption of suffrage for operator members (*see: dispatchers, above*) was nearly heretical, but long overdue. After all, operator members and center managers were suddenly charged with integrating a variety of information-and-data systems and the radio system into a modern communications center. (In some places, the "radio room" is now the dark closet that is the sole province of Radioman).

Even though I'm constantly skeptical, APCO has been successful in holding membership attention and focus on ever-evolving topical issues. Wisely (and in response to demand by now-voting operator members), APCO has focuses extensively on non-radio technical topics and administrative subjects.

Now, for a more specific and practical example of what's "good" about the APCO organization: my friend Floyd Duell. Now retired, Floyd built and ran the radio system for the state of Kansas. He didn't actually *build* it all, but his fingerprints are on a good share of the pieces. Fondly referred to as "the little round man from the DOT," Floyd provided solid advice and plenty of assistance and encouragement to anyone needing help starting a public safety radio system in Kansas. Because Floyd volunteered as the Kansas frequency coordinator beginning in the early 1970s, he was called on by numerous local entities. From the carefree days of one-way commercial broadcast (no pesky station receivers to keep aligned), through the development of a migration plan to modern 800MHz trunking, Floyd was an APCO *institutional resource*. When considering an organization (typically as a faceless, faraway and nebulous collection of fancy suits), we seldom think of an individual. But Floyd constantly proffered the benefits of the organization to willing listeners and would regularly volunteer his time and advice to the local chapter. Nary a chapter meeting was held without Floyd's update on FCC proceedings.

The moral of this short primer is that in our jobs as communications center managers and system administrators—affiliating with a representative trade organization—can be more than just joining a club. In the case of APCO, we can have both organized national representation and practical, local support.

Oh, the letters really stand for Association of Public Safety Communications Officials.

Dunford, MRT's public safety consultant, is manager of technical services for the Lenexa, KS, police department. He is a member of the Association of Public-Safety Communications Officials-International. [His email address is ddunford@ci.lenexa.ks.us]

System solutions and innovations *only from Andrew*

**HELIAX®**

You want to build your system, flip the switch and move on.

HELIAX Solutions...

provide the best balance of mechanical and electrical performance.

Customized kitting solutions...

ensure accurate, compatible, comprehensive orders in just one line item.

World Class Services...

include 24x7 customer support, a dedicated account team, training for your installers, daily order reports, extranets, bar code inventory, shipping control and software tools.

Specify Andrew HELIAX...

You'll finish faster and walk away worry-free.

New! Only from Andrew

HELIAX products are constantly evolving. We never stop looking for ways to improve.

- **RingFlare™ OnePiece™**
one-step connectors.
- **EASIAx® Plus**
one-step, 15 second cable prep tool.
- **VXL5-50**
one-cable "jumperless" transmission line

**ANDREW®**

Andrew Corporation
10500 W. 153rd Street
Orland Park, IL 60563

www.andrew.com

1-800-255-1479
Fax: 1-800-349-5444

Request packet #485 for
more information

Circle (19) on Fast Fact Card

Antenna-testing methods

By Harold Kinley

Generally speaking, land mobile radio technicians favor forward and reflected power measurements to determine the operating condition or tuning of an antenna. During the installation of a mobile radio antenna, a wattmeter is inserted into the transmission line near the transceiver. The transmitter is keyed, and the forward power is measured. Next, the wattmeter is set to measure reflected power, either by turning the "slug" in the reverse direction or by turning a switch to the "reflected power" position. The less the reflected power (relative to the forward power), the better the antenna match. This method is straightforward and works well. However, there are times when other techniques can aid the technician in checking or tuning the antenna.

Trimming the whip

When a new antenna is installed on a vehicle, it must be tuned at the frequency of the radio to perform properly. Too much reflected power will cause the "foldback" circuit to reduce the transmitter power to protect the final stage from excessive reflected power. Thus, it is essential that the antenna be "tuned" so that it presents a 50Ω load as seen by the transmitter.

The directional wattmeter is used, as previously described, to tune the antenna, while the whip is trimmed, until the reflected power is at a minimum (or low, compared to the forward power). Usually, the process is simple. However, confusion can sometimes arise over whether the antenna rod is already too

short or it needs further trimming. Remember, you can't "put it back" if it is cut too short. So, the question becomes: "To cut or not to cut?" If you cut it too short, you have to start over with a new antenna rod, wasting time and money. There are ways around this problem, however.

Multifrequency radios

If the radio being used is a multifrequency radio, then the high and low frequencies can be used to tell whether the antenna is too long or too short—provided that the frequency separation between the highest and lowest frequency is sufficient. Simply set the radio to the lowest frequency and check the SWR or percent reflected power. Then, do the same at the highest frequency. If the SWR or the equivalent percent reflected power is better on the high frequency, then the antenna is too short. If the SWR or equivalent percent reflected power is better at the lower frequency, then the antenna is too long. The antenna rod should be cut so that the best SWR is seen at the mid-frequency range, with about the same rise in SWR at the lowest and highest frequencies. See Figure 1 below. Table 1 below shows SWR vs. percent reflected power. If the antenna is a wideband type, then the measurements at the low and high end of the frequency range may not be sufficiently different to indicate whether the antenna rod is too long or too short.

The tuning wand

A tuning wand can be made by wrapping three to four inches of aluminum foil around the end of a wooden dowel and then securing the foil with electri-

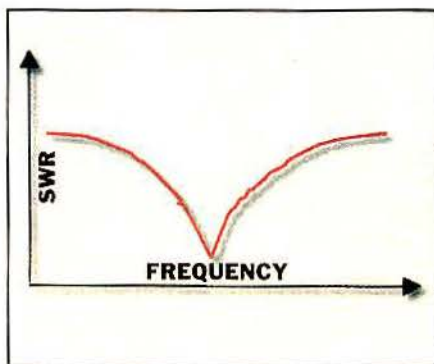


Figure 1. Plot of frequency vs. SWR.

SWR	REFLECTED POWER (%)
1.22	1
1.33	2
1.42	3
1.5	4
1.58	5
1.92	10
2.26	15
2.62	20
3	25

Table 1. SWR vs. reflected power (%).



Photo 1. An MFJ model 259B SWR analyzer.



Photo 2. Inputs for the above SWR analyzer.

cal tape. Then test the antenna by moving the wrapped end of the dowel up the antenna rod while observing the reflected power on the wattmeter, as shown in Figure 2 on page 20. If the reflected power increases as the tuning wand approaches the tip of the rod, then the rod is too long. If the reflected power decreases as the tuning wand approaches the tip of the rod, then the rod is too short.

The MFJ SWR analyzer

The MFJ model 259B SWR analyzer (Photos 1 and 2, above) is popular

Contributing Editor Kinley, MRT's technical consultant and a certified electronics technician, is regional communications manager, South Carolina Forestry Commission, Spartanburg, SC. He is the author of *Standard Radio Communications Manual, with Instrumentation and Testing Techniques*, which is available for direct purchase. Write to 204 Tanglewilde Drive, Spartanburg, SC 29301.

Kinley's email address is hkinley@home.com.

How to get the Project 25 technology you need without getting soaked.



For real value in a Project 25 radio, opt for technological liquidity. Unlike other radios, the Racal 25 is designed to adapt to change simply by upgrading software. That means cost-effective migration to the latest system improvements and advanced encryption like Triple DES or AES without hardware changes. The Racal 25 also gives you multimode shadow channel operation, cloning, keypad programming and lithium ion smart battery technology, all in the smallest, lightest, toughest submersible package. So don't sink money into obsolescence. Stay on top with the Racal 25.

Racal Communications, Inc., 5 Research Place, Rockville, MD 20850 www.racalcomm.com 1-800-258-4420

RACAL

Federal agencies can order Racal 25 on Department of the Interior Narrowband Radio Contract #N660-C98-1007.

Circle (20) on Fast Fact Card

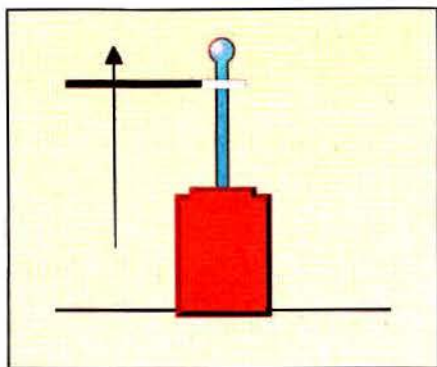


Figure 2. In many cases, the 'tuning wand' can be used to determine if the antenna rod is too long or too short.

among radio amateurs. However, the usefulness of this device is not limited to ham radio use. The analyzer is simple to use, inexpensive and portable, and it has a self-contained signal generator for finding the resonant frequency of antennas and other frequency-sensitive devices or circuits. Hook the coax line to the analyzer and tune the frequency of the analyzer to produce the lowest SWR indication. This indicates the resonant frequency of the antenna. You can also check the bandwidth of the antenna by adjusting the frequency until the SWR indicates "2:1" on the upper and lower side of the resonant frequency. Note the

frequencies at which the SWR is 2:1. This is the 2:1 SWR bandwidth of the antenna. Analyzer models are available that handle VHF highband as well as UHF land mobile frequencies.

Photo 3 at the right shows the analyzer locating the resonant frequency of an antenna. As shown, the resonant frequency is 151.34MHz. The SWR at this frequency is 1:1, as shown on the lower left meter. Photo 4 on page 22 shows the frequency ranges available on the model 259B.

Return-loss bridge

The return-loss bridge is also useful for determining the resonant frequency of an antenna or other frequency-sensitive devices. Figure 3 on page 22 shows the setup for using a return-loss bridge. Here, a tracking generator is used with a spectrum analyzer to display the response of frequency vs. return loss of the device (the antenna) under test (DUT). First, the reference is established by shorting, or leaving open, the port where the DUT is connected. If the output of the tracking generator is set to 0dBm, then the reference should reach almost to the 0dBm mark on the display. Then, the antenna is connected and the tracking generator is set to sweep the



Photo 3. Resonant-frequency readout.

proper frequency range to be checked. The response curve of the return loss will look like the one shown in Photo 5 on page 24. The resonant frequency will be the *lowest* point on the curve (the point where the return loss is the greatest). Although this method is quite accurate, it is seldom used to check mobile antennas because of the required equipment.

The time-domain reflectometer

The time-domain reflectometer (TDR) is used to determine where a fault lies along a transmission line. It can also be used to determine the length of a transmission line. Figure 4 on page 22 shows how the TDR is connected and used with an oscilloscope to check a

**APB! MEDALLION™
GOES INTO HIDING!**

An Allen Telecom Company
Stripes of Quality

Mount a traditional antenna in a highly visible place and you invite vandalism. The appearance of our low profile Medallion™ antenna makes hidden applications a natural! Our durable, water-resistant (and unnoticed!) design ensures long, reliable performance for remote meter reading, vending machines, bank ATMs, overnight delivery boxes, or anywhere wireless data monitoring is used.

Our new products – including the Medallion low profile antenna – may be found on our web site at www.antenna.com.

antenna specialists

800-321-9977

The Motorola R2625: Designed to work on ASTRO® turf.



If you work with ASTRO® 25 diagnostic testing, the Motorola R2625 may be just the analyzer you've been waiting for.

The R2625 is specifically configured for ASTRO 25 (APCO Project 25) diagnostic testing, as well as for ASTRO 25 with conventional two-way analog systems. The R2625 takes all the features you like about our R2600 model and combines them into a special digital hardware platform that's especially ASTRO- friendly.

Standard features include:

- 400 kHz – 1 GHz frequency range
- Duplex generator
- Spectrum analyzer
- RF wattmeter
- And much more...

Optional features can be added to enhance the unit further:

- Tracking generator
- Cable fault testing
- High stability oscillator
- High performance spectrum analyzer with markers
- Programmable test set-up memory
- ASTRO 25 encryption
- ASTRO 25 trunking

The R2625's specialized, dedicated, easy-to-access test screens are conveniently grouped together to expedite test set-up. The R2625 accepts both customer and key test codes for encryption testing, and delivers an impressive

amount of standard features in its design:

- Dedicated screen displays for convenient observation or printout of test results
- Innovative use of soft keys and windowing
- Fast reacting autoranging scales with both analog and digital readouts
- Signaling encode and decode functions

It's all here...in a rugged and compact test unit that allows you to perform many complex operations with a single machine.

Because the rugged R2625 withstands heavy use and can be powered by a variety of power sources, it's ideal for field applications.

Here's the best part: Starting at less than fourteen thousand dollars, the R2625 is far and away your best value for ASTRO 25 testing.

The R2625. It's the newest, most affordable solution to your most ASTRO-nomical concerns.

Call: **1-800-422-4210** or contact your Motorola Representative.



Motorola, the stylized M Logo and all other trademarks indicated as such herein are trademarks of Motorola, Inc. ® Reg. U.S. Pat. and Tm. Off.
© 2000 Motorola, Inc. All rights reserved.



MOTOROLA

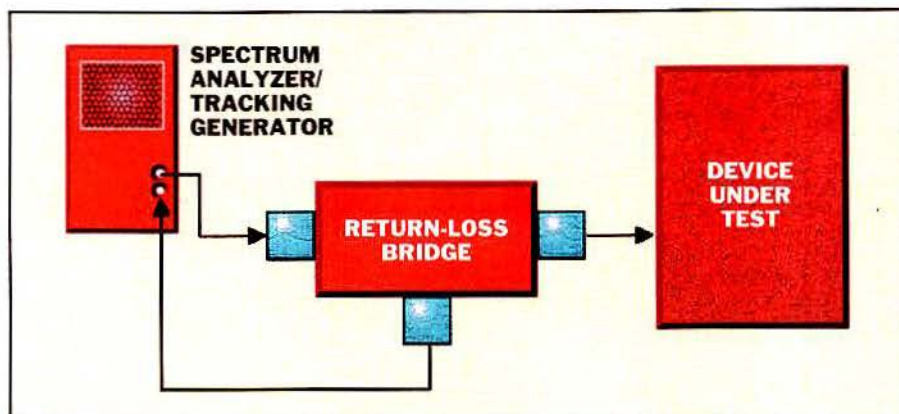


Figure 3. This setup is used to check the resonance or response of a frequency-sensitive circuit, such as an antenna or a filter.

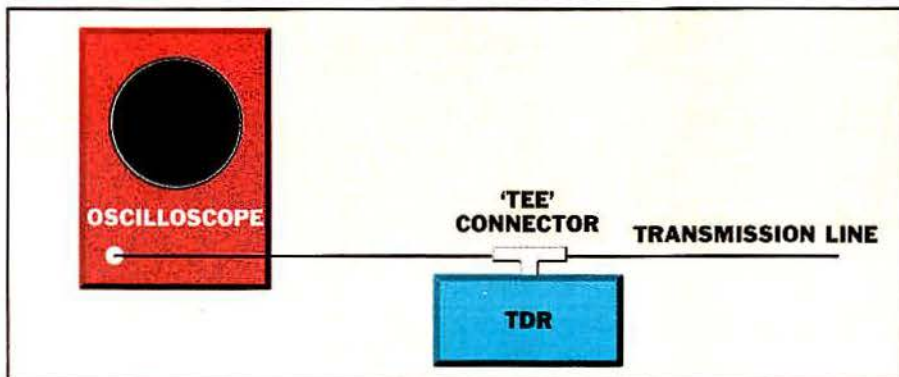


Figure 4. This setup is used to determine the location of faults or the length of the transmission line.

transmission line. Photo 6 on page 24 shows the oscilloscope waveform produced by a TDR connected as shown in Figure 4. The initial, or incident, pulse is shown to the left on the display. The horizontal timebase is set to $0.1\mu\text{s}$ per division. The transmission line being tested has a velocity factor of 0.66, or 66%. This means that a wave traveling on the transmission line will travel at only 66% of the velocity it would travel in free space. The free-space velocity of a radio wave, in meters, is 300,000,000mps. Thus, the velocity of a wave on this cable will be $0.66 \times 300,000,000$, or 198,000,000mps. Note that on the oscilloscope display, the return pulse is delayed by two divisions, or $0.2\mu\text{s}$, from



Photo 4. Available frequency ranges (259B).

Geographic Signal Coverage At Your Fingertips.

The STI-9400 Mobile Signal Measurement and Analysis System

From automated field measurement to analysis and report, the STI-9400 is the most cost-effective and easy-to-use signal measurement and coverage analysis system on the market.

Select a receiver for AMPS, SMR, GSM, CDMA, etc. to be integrated into the STI-9400, or an interface/driver for automation of popular spectrum analyzers and service monitors for drive-test signal measurement.

Analyze your signal measurements on the STI-9400 screen and create reports in the field. The STI-9400 instantly creates signal coverage "contour plots" and statistical measurement summaries.

The STI-9400 comes complete with street map data for the entire USA and is also compatible with .TAB map files.

The first step toward improving system coverage is to understand current system performance.



STI Survey Technologies Incorporated

"Geographic Signal Coverage At Your Fingertips."

877-848-8500 toll free

local: 503-848-8500 fax: 503-848-8534

<http://www.surveyltech.com>

Email: marketing@surveyltech.com

17980 S.W. Shadypeak • Beaverton, OR 97007

No Wireless Strategy?

It's not too late—
Our dedicated Custom
Engineering team will
turn your product into a
wireless machine in no
time at all.

Integrating the Expedite™
CDPD modem module into
your product provides
secure wireless
transmission of
data without using
cumbersome
phone lines.

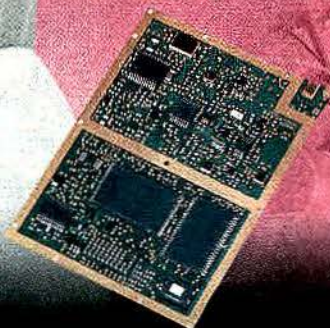
Businesses
need anytime,
anywhere access
to information.
Adding wireless capa-
bilities to your product
will help end users
increase productivity
and decrease costs.

Expedite's small size and
low cost make it easy to
lose the wires.

Computer Integrat
Point-of-Sal

Inventory
Monitoring

ATM AVL
Telemetry



The Expedite modem
and developer's kit are
available through...

Expedite CDPD Modem


NOVATEL WIRELESS

Wireless Magic by Novatel



Global Wireless Data
877-BUY-CDPD
www.wireless-data.com

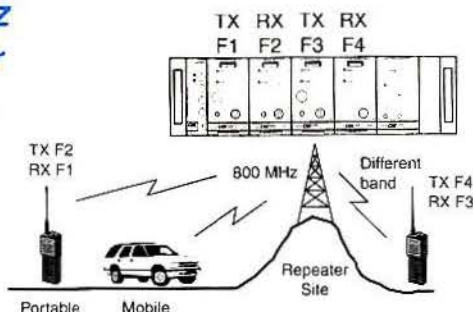
Circle (24) on Fast Fact Card

Visit Novatel's web site for
product information at:
www.novatelwireless.com/ad

The Daniels 800 MHz Crossband Repeater

Use your 800 MHz radios to talk with users of:

VHF lowband*
VHF
UHF
AM
900 MHz



800 MHz Interoperability Issues

Requirement:

An organization using the 800 MHz frequency band needs to communicate with another organization that uses a different radio frequency band.

Solution:

An 800 MHz crossband repeater has the ability to transmit and receive on different bands. For example, if the crossband repeater received an 800 MHz signal, it could retransmit the signal on UHF. The system can also be configured to retransmit 800 MHz to its own users at the same time it retransmits the other band and vice versa.

* Note: VHF lowband systems now available with noise blanking.

Call Toll Free: 1-800-664-4066
Outside U.S. & Canada: (250) 382-8268
Email: sales@danelec.com
Web: www.danelec.com

DE DANIELS
ELECTRONICS LTD.

CIRCLE (25) ON FAST FACT CARD

Total Remote Control

with the world's most flexible
2-way Remote Controllers and Mini Consoles ...



For info on the IDA line
of programmable Tone & DC Remotes
contact us at:

1-800-627-4432 / 701-280-1122
218-233-1886 fax
sales@idaco.com

IDA
CORPORATION

1345 Main Ave. Fargo, ND 58103

CIRCLE (26) ON FAST FACT CARD

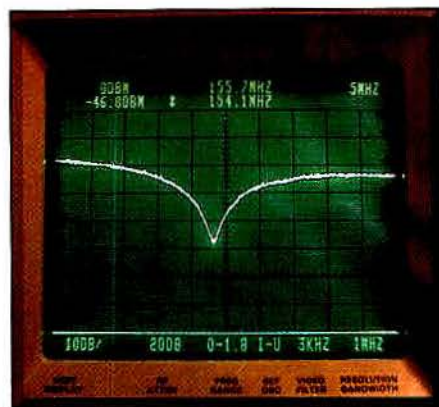


Photo 5. A return-loss response curve.

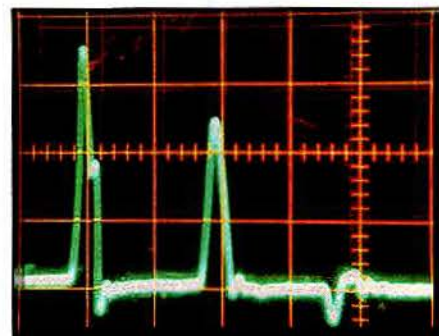


Photo 6. A TDR oscilloscope waveform.

the incident pulse. In $0.2\mu\text{s}$, the wave will travel $0.0000002 \times 198,000,000$, or 39.6m. This equals 39.6×3.2808 , or 129.92, feet. Thus, the wave has traveled 129.92 feet between the times of the incident pulse and the reflected pulse on the oscilloscope. To obtain the length of the transmission line, you must halve this figure because it represents the time during which the pulse travels up and back down the line. So, the length of the transmission line is $129.92 \div 2$, or about 65 feet.

Halve the pulse time because it represents the time during which the pulse travels up and back down the line.

Each of the test and measurement procedures presented here has its appropriate use. You may not need to use some of these procedures or setups every day, but don't overlook some of these alternate methods of doing things when the need arises. We tend to get used to doing things the same old way and to resist changes in our methods and techniques. Some of these techniques can be quite revealing and interesting.

Until next time—stay tuned! ■

Free Options til September 15, 2000
Tracking Generator
Analog - Digital Paging



CSM-1000 Communications Service Monitor

Introducing the new CSM-1000 service monitor. With powerful digital features, this new communications test tool gives the LMR industry what it needs for both field and bench measurements. The CSM-1000 includes a 100 KHz to 1000 MHz spectrum analyzer, full-duplex generate and receive, 200 watt power meter/dummy load, 50 KHz oscilloscope, dual tone generators external VGA monitor connector and RS-232 interface.

Measurement tools include deviation, power, SINAD, frequency error, received CTCSS, DCS and DTMF, and selectable audio, RF and video bandwidth filters. The unit weighs in at 26 pounds without battery.

Options include a tracking generator, analog and digital paging, high stability timebase, a 2 hour capacity battery, rugged carrying case and a planned digital receiver.

Software updates are available from our web site and can be installed remotely in your shop, using the included Windows™ upload software.

If you are looking at replacing your old service monitor or upgrading to a new, more powerful instrument, look to the CSM-1000.

Leasing program available.

World Wide Web:
www.csm1000.com

Circle (66) on Fast Fact Card



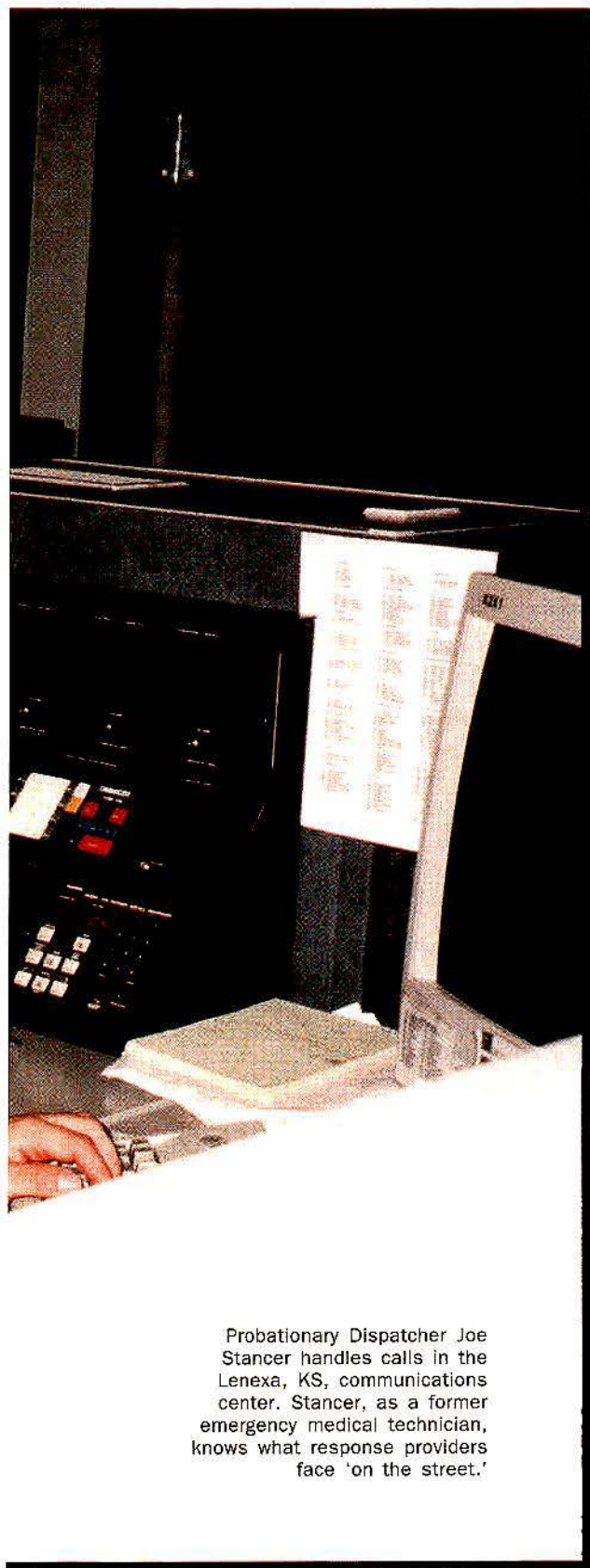
Link Communications, Inc.

Phone: (406) 245-5002 / FAX: (406) 245-4889

Sales Order Number: 1-800-610-4085

The longest day





Probationary Dispatcher Joe Stancer handles calls in the Lenexa, KS, communications center. Stancer, as a former emergency medical technician, knows what response providers face 'on the street.'

A case study of how public safety dispatchers and patrol officers interact with mobile radio communications and how they depend on it 'to protect and serve.'

By Nikki Chandler and D. A. Keckler



um-da-dum-dum. This is the city—Lenexa, KS. [Sorry, we've *always* wanted to do that.] It is shortly before 3 p.m. on a warm June afternoon. In fact, it's June 21—summer solstice: "The longest day of the year." Through the good graces of *MRT's* public safety consultant, David O. Dunford, who manages the technical support for the Lenexa

Police, and Steve Davidson, communications unit manager, who runs the show, *MRT* has been invited to observe a typical day in police communications. Reporting will take place simultaneously from the points of view of the 9-1-1 PSAP/dispatch operators and from those of the officers on patrol.

Our aim is not to present an episode of *COPS*, full of car chases and busts, to *MRT* readers. Real police work is often tedious and grinding, and we're here to examine how real human beings interface with almost 70 years of radio technology advancements.

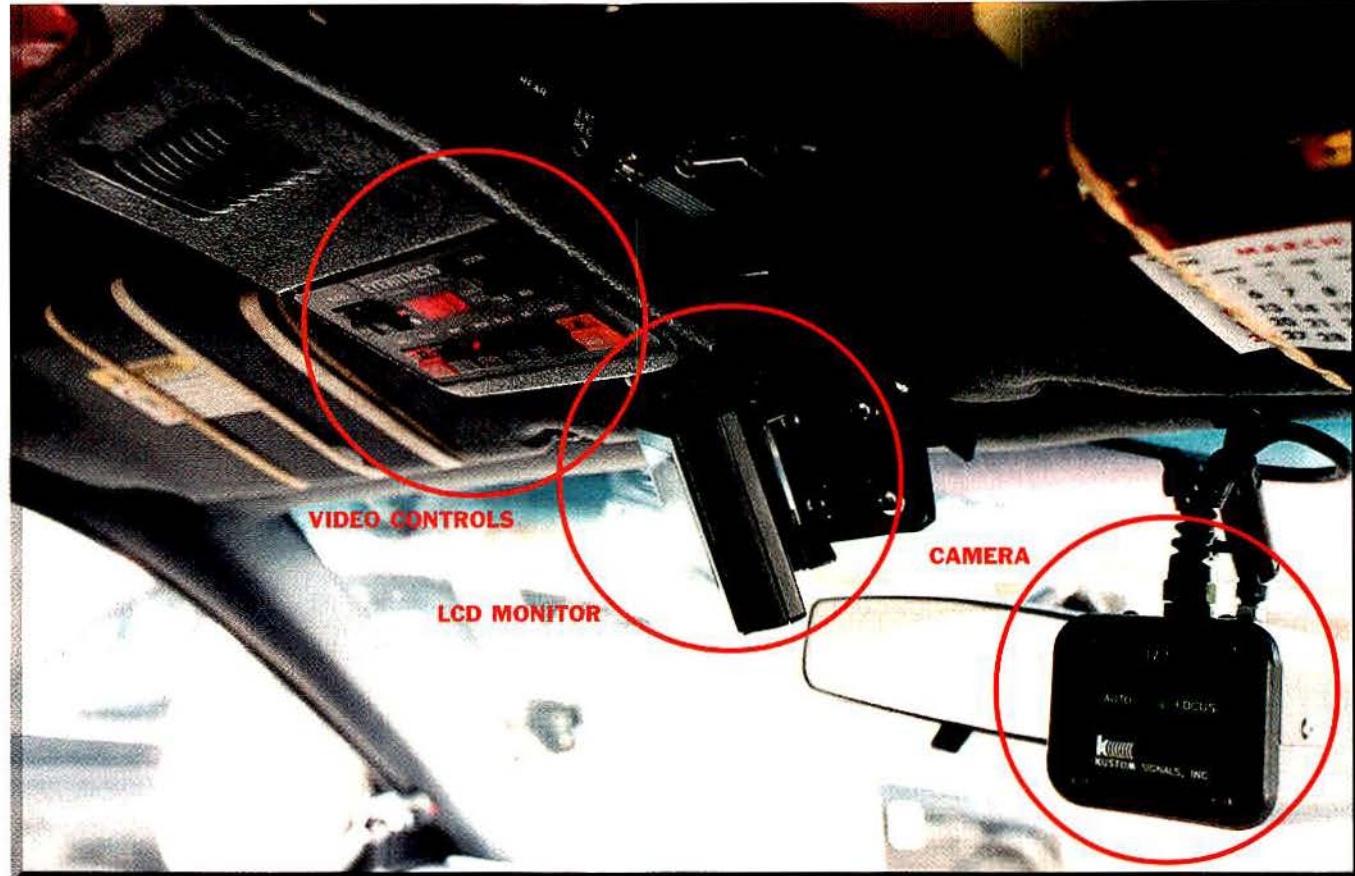
Lenexa is a predominantly suburban community with a resident population of about 40,000 and a daytime population about triple that figure. Located about 15 minutes southwest of downtown Kansas City, MO, it serves both as a bedroom community and a host to numerous professional offices, merchants, warehouses and light manufacturing. It is a progressive city, rapidly growing as population has migrated out of the urban core. For a city of its size, Lenexa has invested heavily, in police/fire/EMS services and infrastructure.

We arrive at the Lenexa Police Department just as the third watch is beginning. Dispatch and patrol generally take their pre-shift briefings together so that both ends of the radio link are "on the same page." Ushered through the security doors, we are quickly split up to our appointed tasks. Chandler will work at first with Dispatcher trainer Virgel Stigall, and Keckler will ride along with Officer Michael Bussell.

[To make this simultaneous report easier to follow, Chandler's PSAP/dispatch experience is printed in red. Keckler's experience with the patrol units appears in blue.]

My first assignment in the Lenexa Communications Center is to join Virgel Stigall at his station. His role for the first part of the shift is primarily dispatching. Stigall has been with the communications center for 15 years. "I started doing this when I was 20. This is my first real job," he says. Stigall,

Chandler is senior associate editor and Keckler is technical editor. They can be contacted at mrt@intertec.com. An expanded version of this story can be viewed on the *MRT* Web site at www.mrtmag.com.



Overhead video equipment in Lenexa's cruisers includes taping controls (left) and an LCD monitor (center) for the video camera (right).

slender and young, but authoritative, speaks in a quiet voice. "We just changed shifts, so I'm really in a 'state' of confusion. I haven't had a chance to get out of that 'state.'" From what I can see, however, he has everything under control.

As I grow accustomed to what I am listening to and looking at, a call comes in for Stigall to dispatch—a diabetic is having problems, but it's not urgent.

At any given time, three specialists staff the communications center, one taking the role of call-taker, one on dispatch and one on records management and backup. (Employees are cross-trained and can perform any function at any time). Joe Stancer, a former EMT, takes calls right now, while Kelly Lafary is on "Channel 2."

Stigall explains that Lenexa police do not go on many ambulance calls—just the urgent ones—so an officer will not be going on the diabetic call. Each medical emergency call is routed from the Lenexa Communications Center, a primary PSAP, to the county communications center, a secondary PSAP.

"It's kind of interesting for them when their 9-1-1 rings," Stigall says. "That usually means they are going on a call. We get a lot of 9-1-1 calls where we really won't go on a call."

Right now, I am looking at Stigall's main screen. The CAD system that

Lenexa uses operates on the Alert computer system, which also runs other inquiries such as L-tests and N-tests. The ALERT system comprises several large databases running on an IBM main-frame computer. This CAD system was originally designed for the Kansas City, MO, police department. "It's a home-made CAD program," Davidson says. "Roll-your-own. Custom-written, we share it with four other departments."

The black boxes located to the left of this CAD screen are an Orbacom TDM-150 console, atop a Zetron model 21D instant call recorder. Eight speakers line the top of the console, the portals to 30 radios and monitors. To the right of the main CAD screen is a smaller monitor displaying a touch-screen version of the Orbacom console, which accesses the scanning of area police, fire and public works agencies. To the dispatcher's left, an ALI/ANI screen is situated above the phone-line buttons.

Lenexa's communications center answers four 9-1-1 lines, eight administrative lines and five seven-digit lines (what used to be the emergency numbers before 9-1-1). Direct lines connect with other police and civic departments.

After I sign a liability waiver and undergo a quick background check, Bussell and I load ourselves into a black-and-white cruiser outside the police garage. First comes a quick

synopsis of the rules for "ride-alongs" (in official terminology, "gratuitous passengers") and an equipment review, including the shotgun and the MP-5 sub-machine gun. It is sobering that you might become an officer's support in an extraordinary situation. The electronic equipment is a little more familiar to me, though no less intimidating. (See box on page 29, opposite.)

The ergonomics of driving a car and operating this electronic arsenal seem to work surprisingly well for the officer behind the wheel, but there is not much room left for portly "gratuitous passengers" on the right-hand side. No matter; Lenexa's officers usually patrol alone. Consequently, backup often appears without being requested.

Oddly enough, despite all the technology and accessories, I discover during the day that the most indispensable items inside a police cruiser are strategically placed Velcro strips and 1/2" rubber bands around the sun visors, which hold the miscellaneous "desktop" items and paperwork that an officer handles during his shift in this mobile "office."

Bussell is usually in the Directed Patrol Unit (DPU) and spends much of his time working "plainclothes" in an unmarked car. The six-person DPU proactively focuses on crime within a narrow commercial corridor. "The thing I like to get the most is drugs," Bussell says.

For plainclothes assignments, undercover officers have started using Nextel Communications handsets instead of standard police radios, to avoid attracting attention. [See Dunford's "Public Safety: '10-2'" column in the February 2000 MRT.]

Bussell and several other officers have been preoccupied for four months with a multijurisdiction serial murder case that hit the national spotlight. With that investigation winding down, this is his second day to "relax" as a uniformed officer roaming the community.

"I'm having fun, just going out and working patrol," Bussell says. A tall, brawny, mustachioed 30-year-old, he strikes an imposing figure that is only slightly softened by his summer uniform of white shirt and blue shorts, for which he takes some good-natured ribbing from officers who are still wearing navy blue, full-trouser uniforms.

In addition to the mobile radio and body mic, most officers carry a belt-clipped Motorola HT-1000, or HT600/P200, portable with epaulet mic. All personnel also carry alphanumeric pagers. Radio checks are performed for all systems. Officers can usually hear, sitting in roll call, how well the active mobile radios are performing for the previous shift.

"But I'll give my 'starting' just to make sure, and right then [dispatch] will tell me, 'Yeah, you're pretty 10-1 (bad communications),' and I'll put this down and grab another," Bussell says. His checks extend to sirens, lightbar and other equipment.

A call is passed over from Stancer for dispatch. A vehicle has hit a bank kiosk, and there is quite a bit of damage. This call didn't come through 9-1-1; the bank has called the department directly.

1515: We roll out as patrol unit "394." As soon as we hit the street, we get our first call.

"394"

"394: Santa Fe and Rosehill."

"Take information on a non-injury accident; occurred at the credit union [location]. Contact [manager] in the lobby. Customer hit a piece of their equipment outside and then drove home. They know who the party is."

Bussell acknowledges.

Dispatch time-checks the call: "1520."

We get acquainted as we drive to the credit union. Bussell has spent two years with Lenexa P.D. He had been an engineer with the Lenexa Public Works department for four years when he decided he wanted to go into policing. With the city's roster full, he found a position for two years in a nearby city until Lenexa had an opening.

We pull into the credit union bank, and after a quick "just the facts" interview, the manager shows us the hit-and-run "victim." A depositor snagged his pickup truck on one of the drive-through lane pneumatic kiosks, and after being unable to extricate himself, gunned the motor and ripped the device's cowl to shreds. Undoubtedly scared and embarrassed, he drove off (probably remembering too late that he had just made a transaction with his name on it). The damage is estimated at about \$1,500. I notice that Bussell is taking the incident information in the same low-tech fashion that I am: a pen and a small reporter's notebook from his shirt pocket. When he's finished, I ask whether any hand-held devices are used.

"If it was a big case, say it was a burglary of several items, I would go ahead and take *this* in," he says, motioning toward the MCT laptop. "I would take the information down that way, serial numbers and such. For me, it has to be a pretty substantial case. I can usually just 'jot it down' on the non-consequential calls. Some of the guys carry around [Palm Pilot PDAs]. I don't know if they're on a trial basis, but the guys that have them really seem to like them."

Dispatch supplies Bussell with a directory check on the phone number of the suspect in the "crunch-and-run," and supplies other database info as well regarding prior arrests. Bussell uses the in-vehicle Nokia PCS cellphone to contact the suspect, asking him to go to the station and give a statement.

Tag—you're it

Back at dispatch, Lafary offers brownies to everyone who walks into the center. A sergeant walks in, asking for printouts of vehicle tags he had run earlier. He also needs the "criss-cross" city directory.

Stigall runs tags for another officer in the field. The officer is following a car, and Stigall reads the registration to the officer.

"What we do, if we have time, is we'll check the name and the address on the registration to see if we can find any active warrants on these people, associated with the tag," Stigall says. "No news is good news. Because I didn't find anything, I didn't say anything back to him. If I were to have found something, I would have called him on the radio again."

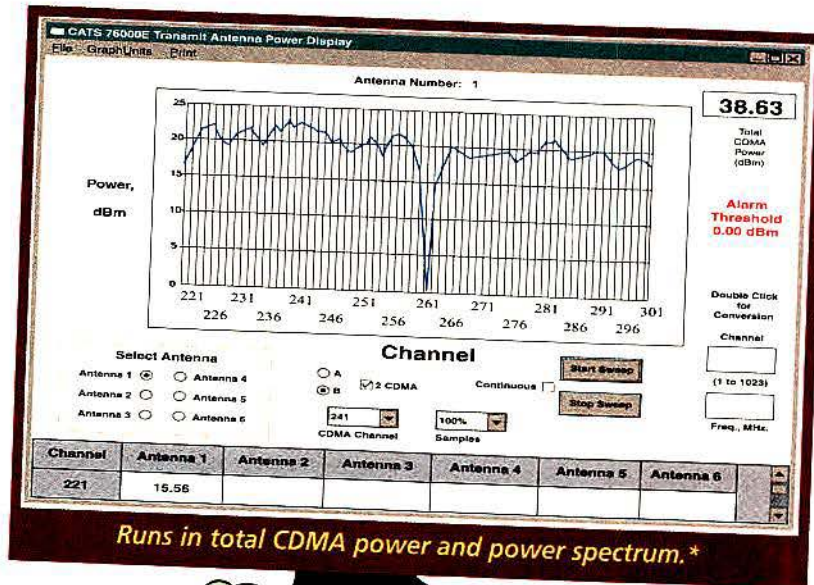
These dispatchers are, indeed, doing more than answering calls and dispatching officers. They are always running tags and fishing for more information to

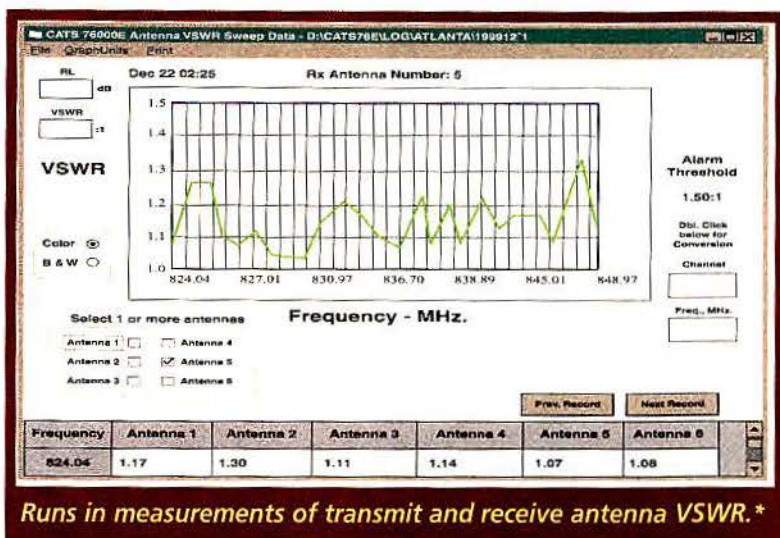
Electronic arsenal

Standard apparatus for each Ford Crown Victoria police cruiser in Lenexa's motor pool (officers do not have dedicated vehicles) includes a Motorola MaxTrac UHF radio, with dash mic and floor-mounted speaker, and a overhead-mounted Kustom Signals Eyewitness in-car camera and in-car microphone (also linked to a remote body mic on the officer's person). The camera has a 3" Citizen LCD monitor so an officer can preview the camera's range, magnification and focus before exiting the vehicle. The body mic/recording system can also be set to start whenever the lightbar is activated. Other equipment includes a Uniden Bearcat scanner, a Dell Inspiron 7000 MCT on a telescoping pedestal, a turn-signal-mount switch to activate the siren and lightbar (plus overhead controls for the same), a Nokia PCS cellphone to bypass the need for interconnect patches, and a Federal Signal Smart Siren SS2000 panel. Most of these control heads and equipment have been packaged by Dunford's technical department into a hand-made, custom-designed console, also incorporating the PA mic, a clipboard, a gooseneck lamp, a dc-power outlet, a flashlight mount and a cup holder, as well as the weapons brackets. The videotape unit, radio and other gear is mounted in a custom box in the police cruiser's trunk, which also contains spike strips and emergency gear. [For more information on these installations, see Dunford's "Public Safety: '10-2'" columns in the March and April 2000 issues of MRT.]



Save serious money. Let our cell site monitor do the legwork for you.





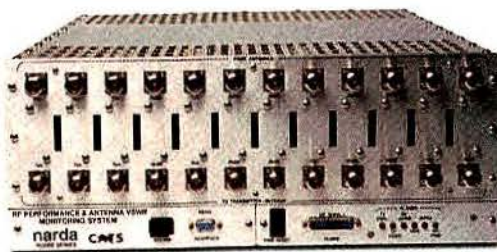
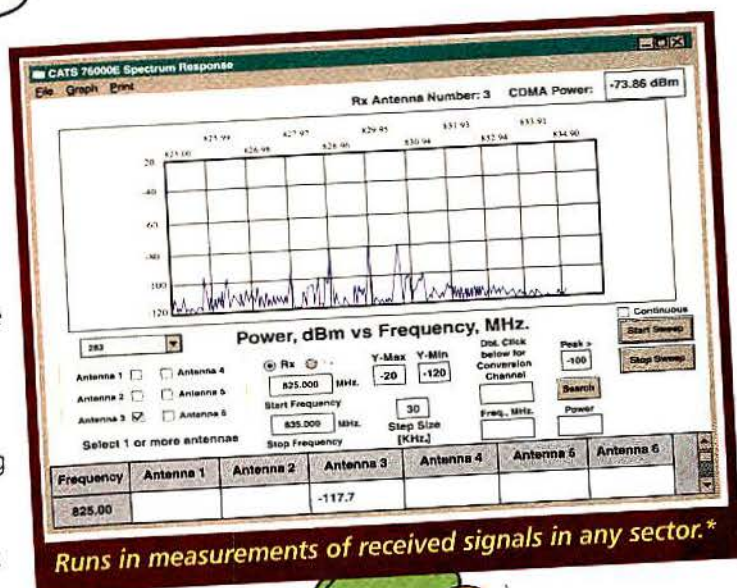
Make great strides in cutting your costs with the CATS 76000E. Just install one in each cell site, and you'll be able to remotely monitor everything from one central location.

From this Network Operating Center, you can measure transmitted power and antenna VSWR eliminating the expense of periodic site visits for routine VSWR measurements and power adjustments. You can check CDMA power per carrier to answer real-time performance questions. Detect interference with our in-line spectrum analyzer—even answer lost call questions.

And that's just the beginning. You can remotely diagnose a cell site and arrive at a comprehensive picture of its problems. With this crucial data, you can determine if an on-site visit is necessary. If it is, a technician can be sent fully prepared to solve the problem.

Install the CATS 76000E. It's an indispensable source for vital cell site information. Call Narda today for an eye-opening demonstration at **631-231-1700**.

Once you do, your budget will have a lot more legs.



The new CATS 76000E

narda
microwave-east

an **L3** communications company
www.nardamicrowave.com



© 2000 L3 Communications, Inc.

Circle (64) on Fast Fact Card

help the police officers any way they can.

On the street, Bussell reflects on this support. "One thing I will say, and you can put me on record for this: We have some of the finest dispatchers and personnel that I could ever ask for. ... These guys and gals, they *work*. It's nothing for them to work 12 or 14 hours in a day if they're [short-handed]. They're always running tags. They may get a little short with me at the end of the night because I'm running so many tags, and I usually try to lay off, then. And they'll dig—like Kelly, when I ran [the kiosk suspect]. She said, 'Well, let me check another thing for you.'

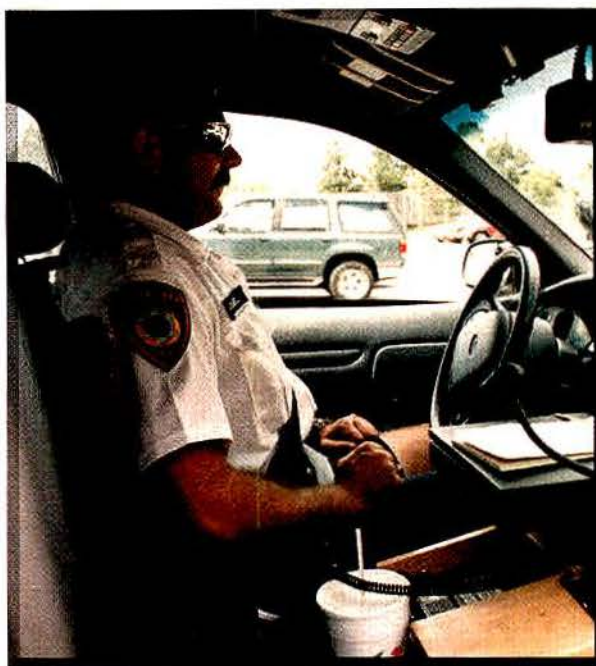
"She didn't *have* to do that," Bussell says. "I didn't ask her to. She just *does* it. You can't ask for anything better than that."

"A lot of times, people will give the wrong information to the officer," Stancer says. "So you really have to dig. That's what's difficult, is there are so many avenues you can look at."

Stancer says he wants to work on increasing his speed in that area—he

is still in his probationary period. He started with the communications center in February. That's why he is wearing a dark-blue polo shirt and khaki pants. The other dispatchers wear standard-issue police uniforms.

Stigall is in charge of training other



Ofc. Bussell is encircled by electronic aids and radio gear.

dispatchers. Sixteen weeks of on-the-job training is required, plus two weeks in the classroom. Each trainee is "plugged in" with an experienced dispatcher for four months. I wonder how they learn to listen to all the disembodied voices coming out of the speakers and through the headsets. So many people are talking at once, and these dispatchers and call-takers seem to hear it all (or at least what is important).

"You also have to keep your 'third ear' open to what's going on in the room," Davidson says. Call-takers and dispatchers will help each other out if possible, as they are listening to one another.

1535: An intrusion alarm call comes in. "Always dispatch those," Stigall says. "Calling 295 and 334, respond on Brinks intrusion alarm at [location] residence. The garage door."

1536: Bussell, near the location, hears the intrusion call and drives over to support. Units 295 and 334 have the situation under control, and we hit the street again.

Continued on page 44

You Could Be Liable...

for personal injury and property damage claims if you are responsible for a remote communications site that is not in compliance with the Uniform Fire Code and EPA requirements.

Article 64, Section 6404 is directed toward stationary lead-acid battery systems (SLABS), with specific concerns for spill containment and reduction of fire related events. The requirements for this regulatory criteria are mandates, not requests. In the event of a related incident, failure to comply could legally be interpreted as contributory negligence—something no one wants.

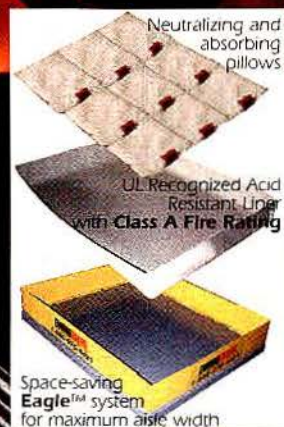
Protect yourself, your facility, personnel, and, of course, the environment where your remote site is located by making sure all regulatory requirements are met.

Enviroguard, the industry leader in compliance and safety solutions, is the right choice. Our services and systems are utilized by governmental agencies, public utilities, and telecommunication leaders nationwide. Let us be your compliance resource.

Remember, a proactive approach to problem solving is far more advantageous and cost-effective than a reactive post-incident scramble.



An Enviroguard spill containment system in service for the City of Los Angeles.



NEW!

For further information, call
1-800-975-4421 (dept. M)

or e-mail Techinfo@egsintl.com

Other requests may be sent to:

Enviroguard

5959 West Century Blvd., Suite 510, Los Angeles, CA 90045 / www.egsintl.com



ENVIROGUARD
COMPLIANCE AND SAFETY SOLUTIONS
A Division of EGS International Inc.

Call for
a **FREE**
video tape.

MS2711

Anritsu

The Picture Is Actual Size. The Benefits However, Are Much Larger.

Introducing something that's going to take a lot of weight off your shoulders: the MS2711™ from Anritsu, the world's first Handheld Spectrum Analyzer. Not only is it three times smaller than any other full featured spectrum analyzer of its kind,

it weighs only four pounds.

For more information call 1-800-ANRITSU or check out our website at www.anritsu.com. The new MS2711 Handheld Spectrum Analyzer from Anritsu. Your big spectrum analysis jobs just got smaller.



Handheld Spectrum Analyzer

©1999 Anritsu Company Sales Offices: United States and Canada, 1-800-ANRITSU, Europe 44(0)1582-433200, Japan 81(0)33446-1111, Asia-Pacific 65-2822400, South America 55(21)522-6922, <http://www.anritsu.com>

Anritsu

One world. One name. Anritsu.

BW / SWEEP

AMPLITUDE

FREQ / SPAN

MODE

JOINING FORCES...

by Matthew Halverson

So, you're having trouble getting permission to build *one* new guyed tower? The local zoning commission has banded with those pesky NIMBYs to shut down your project, and they're deaf to the argument that a 480-foot tower can be made aesthetically pleasing? What do you do? For starters, you can dry your eyes and thank the frequency fairy that your problem is only 1/181st of the zoning nightmare that faced the Michigan State Police (MSP).

To replace its nearly 60-year-old state public safety communications system, and to take advantage of the 800MHz spectrum, the MSP joined forces with Motorola to design the Michigan Public Safety Communications System (MPSCS), the first statewide Project 25-compliant communications system—and they needed 181 new tower sites to do it.

Split up among four phases, the system is scheduled to be completed in Spring 2002. Phase I consists of Southeast Michigan and is already up and running. Phase II is made up of the southwest portion of the state and was completed in September 1999. In June, Phase III became the latest portion of the project to be completed (ahead of schedule), and it consists of the upper half of lower Michigan. The Upper Peninsula makes up Phase IV, scheduled to be online in Spring 2002.

The project, now 75% complete, represents a new breed of public safety communications system. With 181 sites—an increase of 100 towers from the original system—its sheer size is intimidating, yet dimensions alone cannot tell the whole story. With the upgrade to the new digital

system, any subscribing police department in Michigan can “dial up” any other subscriber throughout the state from its mobile units. That means Officer Jones in the Upper Peninsula and Officer Smith in the state capitol at Lansing can talk to each other as if they were only one street apart.

Whether the state had decided to build a communications system of this size or not, everyone involved agreed something needed to be done to update the antiquated system that was in place. MSP Capt. Tom Miller said that in addition to the “dead spots” that users were experiencing, replacement parts for the old system were becoming increasingly difficult to find, and only three of the original 81 towers were in compliance with Michigan OSHA standards.

“We couldn’t maintain part of our infrastructure,” Miller said. “So it had gotten to a critical stage.”

Once it was decided that something needed to be done, the next question was, “What?” After enlisting the consulting services of Sachs/Freeman Associates in the mid-1980s, the state chose to construct a statewide system based on Project 25 standards, despite the fact that the set of standards had yet to be completed.

outside vendor was the next step, and according to Miller, signing with Motorola was simply a matter of finding someone that could give the state what they needed.

“We chose (Motorola) because of their ability to meet the specs of the RFP,” he said. “We had one other vendor, but they weren’t able to meet the specifications.”

The purpose and scope of the system has evolved gradually over the last 16 years. Originally conceived in 1984 with the intent to serve only the state police, it has now expanded to provide the department of corrections, the department of social services and the natural resources law enforcement division—not to mention any local police department that wishes to use it—with digital communications capability.

As the state saw the price for the new system rise, it also saw an opportunity to share out some of the cost.

“As the original studies came back and there was a realization of what it was going to cost to replace it, the idea then was that we would open it up, and the system would be made available to the other state agencies as well as local government,” Miller said.

Miller was quick to point out, however, that the state was not interested in having the county police and sheriffs’



Vendor wanted

Contracting the project to an

Halverson is associate editor

The efforts of the state of Michigan and Motorola to create the first statewide, Project 25 - compliant radio system means users really will be 'calling all cars.'



departments pay for the state's new toy. But with a price tag of more than \$187 million, any help was appreciated.

"The realization is that the cost of operating this system in large part will be borne by the state, and whatever local agencies we can put on the system will help, but it will *never* subsidize the entire cost of the system," he said. "That wasn't the goal. The goal of the system was to build a statewide communications system for public safety."

Joining the system is not cheap. The Motorola portable radios and mobile radio base units that work with the new

technology run for close to \$3,000 *each*, and users must pay a one-time start up fee of \$250 per radio as well as a \$300-per-year charge for programming and maintenance costs. Joining the system has even been cost-prohibitive for some of the smaller local agencies throughout the state. Police in Wayne County have had to collect close to \$4 million through a surcharge levied on 9-1-1 systems in the area to afford to subscribe.

Small town solution

However, Capt. James Caygill said the cost to join the system was well

worth it for the Huron Township Police Department. Huron was in the market for a new system after deciding that its 20-year-old lowband system was in need of an upgrade. The state's offer to join the new statewide system contributed to Caygill's department's decision to subscribe.

Although the radios are costly, Caygill said that what a department pays for the radios, it makes up for by not having to build new towers. The state has estimated the cost of building a tower site at between \$200,000 and \$600,000. Huron Township needed only one new tower for its area, but that's one more than Caygill wanted to build. Subscribers to the state's system are not responsible for building new sites and are not charged for using the towers.

"In my opinion, 'Why do we want to reinvent the wheel?'" Caygill said. "Not only that, but we, as a smaller agency than the state police, have the opportunity to be aboard something that has the expertise of the world behind it."

Motorola provides all of the necessary equipment and handles the programming of the system, and the company trained Huron's officers. Caygill said that having the assistance and security of Motorola's experienced staff has made the transition a relatively painless process.

"Normally, when you put in something new like this, you expect to have a lot of problems," he said. "Now I know the state may have had some problems when they first went online, but when we went online, our people were trained and ready."

NIMBY and Brer Rabbit

Foremost among the problems the state faced in installing the system was the siting of new towers. When building 181 new towers, *some* opposition from local zoning commissions is to be expected, but the state was ill-prepared for the hurdle it would face in completing the infrastructure construction.

"When we negotiated the contract, we were told by the state that the state is exempt from local zoning ordinances," Chuck Cousino, Motorola's project director assigned to the MPSCS, said. "The people from the state believed that. We got challenged on it. The state got challenged on it by a township and lost the challenge in court."

The suit in question that threatened to shut the project down was raised by the Addison Township of Oakland County in June 1996. The township claimed that placing a tower in the location stipulated by the specifications of the system would violate local ordinance restrictions on

The SMR Networking Jungle Has Been Tamed

Cut through the underbrush of competitor's claims about networking.

PASSPORT® accompanies the most customers on their SMR networking journeys on more radio models than any other enhanced trunking protocol.

NTS® removes the mystery from networking with a robust, easy to install and operate infrastructure.

- Wide Area Networking
- Automatic roaming
- Individual ESN & MIN per radio
- 60,000 Unique ID's per site
- Up to 128 sites per network
- Distributed Network Design
- Digital Migration Path



TRIDENT
MICRO SYSTEMS

Two Trident Drive, Arden, NC 28704

(828) 684-7474 • (800) 798-7881 • Fax (828) 684-7874

www.tridentms.com • sales@tridentms.com

Let Trident move you to the top
of the SMR food chain.



Your communications should move as fast.

Introducing the newest in a line of remarkable booster amplifiers – The Intelligent Booster Amplifier (IBA). Designed to operate on moving platforms, the IBA was originally designed to operate on high-speed rail systems. With applications also extending to subway systems and other forms of rail transportation, the AeroComm IBA is a cost-effective method for improving coverage on the railways without building additional sites.

Unlike air travel, rail systems afford the professional traveler the opportunity to use personal wireless services. With the AeroComm IBA, internet on the go, teleconferencing at 150 mph, and all uses of your wireless phone are now possible. Leading technologies such as our Dynamic Scanning Receiver and Global Positioning System provide

constant coverage and high-quality calls along the desired path. As an added benefit, an external computer allows you to program coordinates at known trouble spots – or shut off the



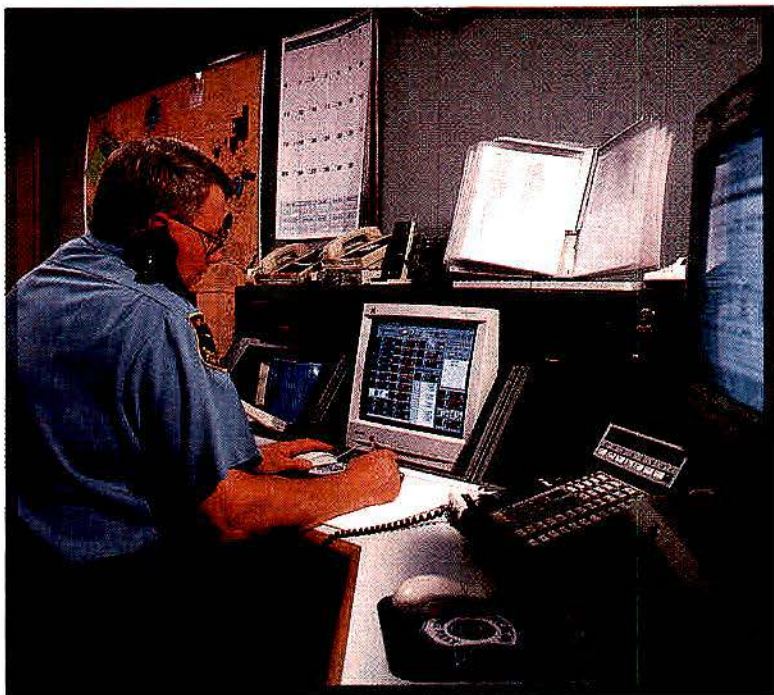
IBA completely in good coverage areas.

Call us at the number below for information on how the Intelligent Booster Amplifier can meet your customers' communications needs.



A Wireless Systems Company

Circle (29) on Fast Fact Card



An officer tests out the Michigan statewide system that was close to being scrapped over siting issues.



however. On behalf of the state police and Motorola, the state legislature enacted Public Act 538 in 1996, which overrules local zoning ordinances and eases the process of tower siting. Under the act, if a local zoning authority does not approve of the location that the state wishes to build on, it must offer an equivalent site within 30 days of notification. If an alternate site is not provided, the state may build on the original proposed site.

"It gives us a mechanism to move through the zoning process with local governments and not get hung up in a lot of public debate and discussions over whether a tower should be built," Miller

both location and tower height. The Oakland County Circuit Court granted the township an injunction that was upheld on appeal.

"As you might expect, this created a

huge concern on everybody's part, because without the exemption, it would be very difficult to build the system at all," Cousino said.

The roadblock would not last for long,

said. "If they don't want it there, the onus is on them to provide an alternative location within 30 days."

Cousino admits that zoning problems were the most challenging issue that

See us at the
APCO Show
Booth #2640

Essential services consider us essential.



With a reputation for reliability and durability since 1951, Sinclair Technologies has established itself as the supplier of choice in the design, engineering and manufacturing of antennas and filter products that essential services turn to. Police, fire and ambulance services rely on Sinclair Technologies when lives are on the line.

SINCLAIR®

www.sinctech.com

USA (800) 288-2763 • CANADA (800) 263-3275

CIRCLE (30) ON FAST FACT CARD



The Most Advanced Antenna Systems for Broadband Wireless Access

Whether you're building a point-to-point or a point-to-multipoint system, Radio Frequency Systems antennas provide the most advanced solution.

With several decades of experience in the design and manufacture of innovative products, RFS has emerged as a world leader in broadband wireless access antenna systems.

RFS offers a wide range of antenna types, known for their superior performance and highest quality.

- **Solid Parabolic Antennas**
- **LMDS Antennas**
- **MMDS Antennas**
- **Sector Antennas**
- **Grid Antennas**
- **Yagi Antennas**

To find out more about how our antennas can make your job easier, call Radio Frequency Systems at 1-877-RFS-WORLD.

RADIO FREQUENCY SYSTEMS
CELWAVE Cablewave



www.rfsworld.com

200 Pondview Drive, Meriden, CT 06450 • (877) RFS-WORLD • Fax (203) 821-3852
Latin America (602) 252-8058 • Canada (800) 267-1762

Circle (31) on Fast Fact Card

Motorola and the state faced, and he was not surprised that reared its ugly head.

"It would be nice if every time an engineer said, 'Oh, I'd like a site at this coordinate' we could send somebody out and say, 'Look, there's a FOR SALE sign right there,' he said. "Never do we get a piece of property where we point."

Upgrades on the go

Siting issues have not been the only concern for the state police and Motorola. Not surprisingly for a project of this size, upgrades and renovations have already been necessary before the system has been completed. When the

project was originally contracted out to Motorola in 1994, the Project 25 standards had yet to be completed, but the contract stipulated that Motorola would conduct the necessary upgrades once the final specifications were determined. According to Miller, equipment upgrades are the most difficult part of the process, logistically.

"Logistics become a big issue," Miller said. "We saw that when we had to upgrade the first phase that wasn't built to the APCO 25 standard, and when we had to go back and do the upgrade, we had to actually touch all of the radios to upgrade them."

There is no master switch to throw when conducting such an upgrade. In fact, more than 4,000 radios had to be "touched" as part of the Phase I upgrade. The process will begin again when the state finishes contract negotiations with Motorola to upgrade the current system to Motorola's new 6.0 platform for integrated voice and data.

"It's going to be significant—almost a 15% increase in the cost of this project—to do this upgrade," Miller said. "It's something we're trying to look at from a long-term planning standpoint. We're looking at building up a sort of revolving fund that would provide us the funding we would need to keep up with the technology upgrades that we'll need to keep the system as state-of-the-art as possible."

A meeting of the minds

As problems have arisen throughout the build-out, Cousino said the most important thing that kept the project moving was the contract the two sides had signed. Issues and discrepancies were bound to come up, but with a contract that both sides could refer to, most problems were dealt with swiftly.

"The strength of investing the time upfront in a solid contract is probably the single biggest thing that got reinforced," Cousino said. "Because there's a tendency to say 'Let's get on with this so we can actually get started building.' You should never give in to that tendency."

In addition to the contract, Miller said that having executive sponsorship made the project run more smoothly. He admits that without the support of the governor's office and the state legislature, the system might never have been completed. Having the government's support made the ratification of the all-important site acquisition act possible.

"We've been very fortunate here that we've had very strong support from our legislature and our executive office," Miller said. "That's really made this thing a success that we wouldn't have had if we hadn't gotten the sponsorship."

Settling in

Although system upgrades will always be necessary to keep up with technological advances, Miller is confident that the state will not have to deal with zoning authorities for a long time to come. The system was built with the expectation that it would last for several decades.

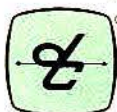
"We believe from an infrastructure standpoint that these towers will be around a long, long time," Miller said.

WHY KEEP REPEATING YOURSELF?

Two-way communication in high noise environments is difficult and possibly hazardous. Now you can communicate clearly and protect your hearing in high noise areas with a simple communication system from David Clark. Just add our Noise Attenuating Headsets and Radio Adapter Cords to enhance the performance of your two-way radios. Our high quality headsets feature rugged construction and a certified Noise Reduction Rating (NRR) of 24 dB. They're available in Over-The-Head or Behind-The-Head styles for use with safety caps and helmets. Boom mounted or throat microphones enable hands-free performance. Choose Voice-Activated (VOX) or Push-To-Talk (PTT) systems with adapter cords for over 300 two-way radios. For clear two-way communication in high noise, there's only one name worth repeating — David Clark.

For more information and a FREE demonstration, call toll-free:

1-800-900-3434



David Clark COMPANY
INCORPORATED

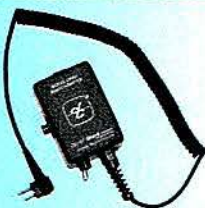
360 Franklin Street, Box 15054, Worcester, MA 01615-0054 U.S.A.
TEL: (508)751-5800 E-Mail: sales@davidclark.com FAX: (508)753-5827
Visit our web site at www.davidclark.com



Your
Two-Way
Radio



Radio
Adapter
Cord



Noise
Attenuating
Headset



HE TAKES RISKS
EVERY DAY.

WITH OPENSKY®, HIS
COMMUNICATION SYSTEM
ISN'T ONE OF THEM.

HIS JOB:

Lt. Jake Richards doesn't enter a burning building without the right equipment — his turnout gear, his SCBA, and his OpenSky radio.

OpenSky integrates voice and data on the same channel and puts an entire IP-based mobile network in the palm of his hand. This means he's never alone in a crisis. He can communicate directly with his team, the paramedics, the police — or any agency on the OpenSky network. Lt. Richards never knows what the next call will bring, but he does know that with OpenSky he'll always be connected.

OUR TECHNOLOGY:

OpenSky gives you a flexible, scalable, packet-switched mobile communication network with end-to-end IP voice and data applications for your statewide, regional or local network. Utilizing an open architecture and industry-standard products, OpenSky delivers cutting-edge technology at an upgrade cost that's remarkably affordable. For increased coverage, capacity and quality of service, switch to OpenSky.

OpenSky

Always on. Always there.

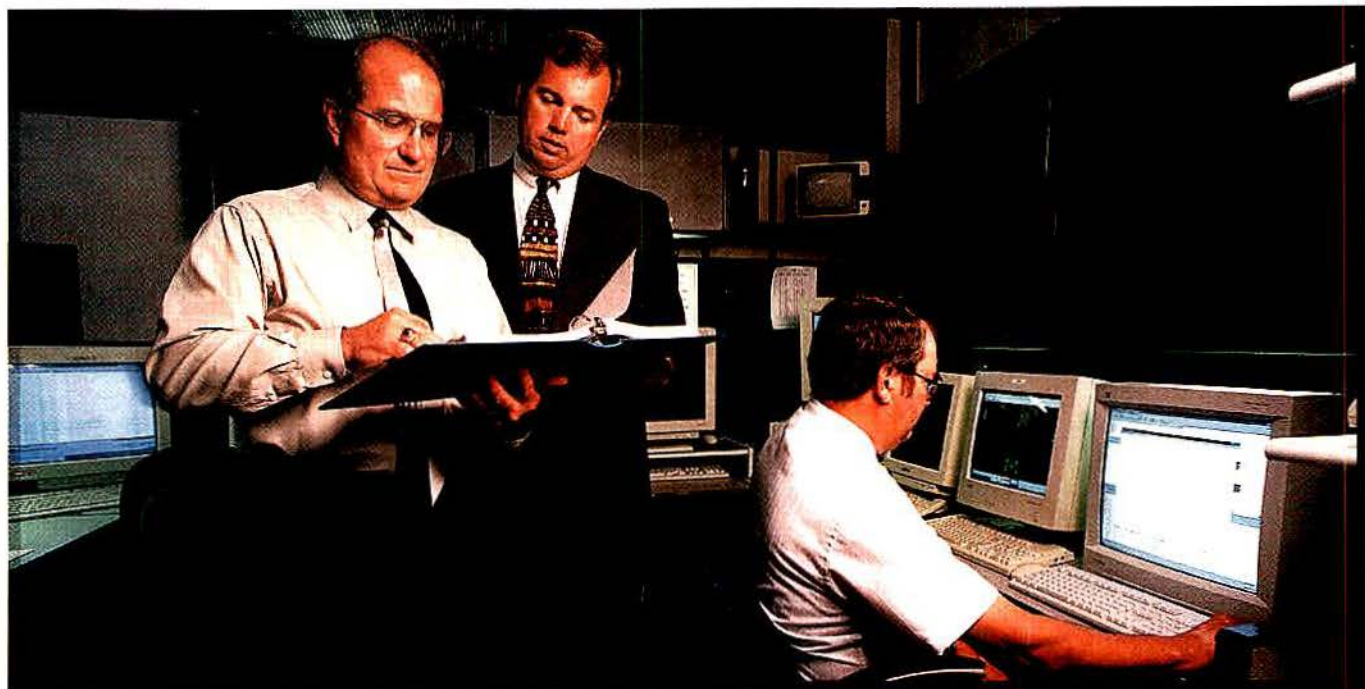
Circle (33) on Fast Fact Card

Call 1-877-OPENSKY to schedule a free, customized OpenSky consultation.

Visit us at APCO Booth #320
www.macom.com/opensky/mrt/aug

tyco / Electronics / **M/A-COM**





Cousino (left) and Miller (right) say the relationship that MPS and Motorola formed was an integral part of making the project work.

"Those will be around for at least 40 years. The electronics component of it (I believe that the way technology is), we're going to have to look at upgrades periodically."

Cousino is even more optimistic.

"We've got hi-rod, solid-member, galvanized towers, Miller buildings that

have very, very strong specs and very aggressive specifications to them," he said. "They'll be around for 100 years."

Regardless of whether technological advances make the system obsolete, both sides believe that they have built the foundation for a positive working relationship suitable for addressing issues

and concerns in the future.

"The relationship with the state is the thing we're most proud of," Cousino said. "The fact is, the state has been very accommodating, and we feel very good about the relationship we have with them. We get a hurdle, we find it, we sit down, we solve it and we move on."

WELCOME TO TPL COMMUNICATIONS WEB PAGE

File Edit View Favorite Tools Help

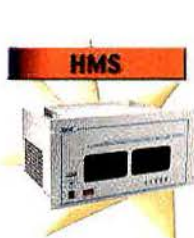
Address <http://www.tplcom.com>

Welcome to

Leadership by tradition.

TPL
COMMUNICATIONS

The Leader in R.F. Power Amplifiers



Visit our web site and get more information on these products, and more!

CIRCLE (34) ON FAST FACT CARD

The New Motorola Radio is Now Complete



VOICE PRIVACY

Call Now for Details

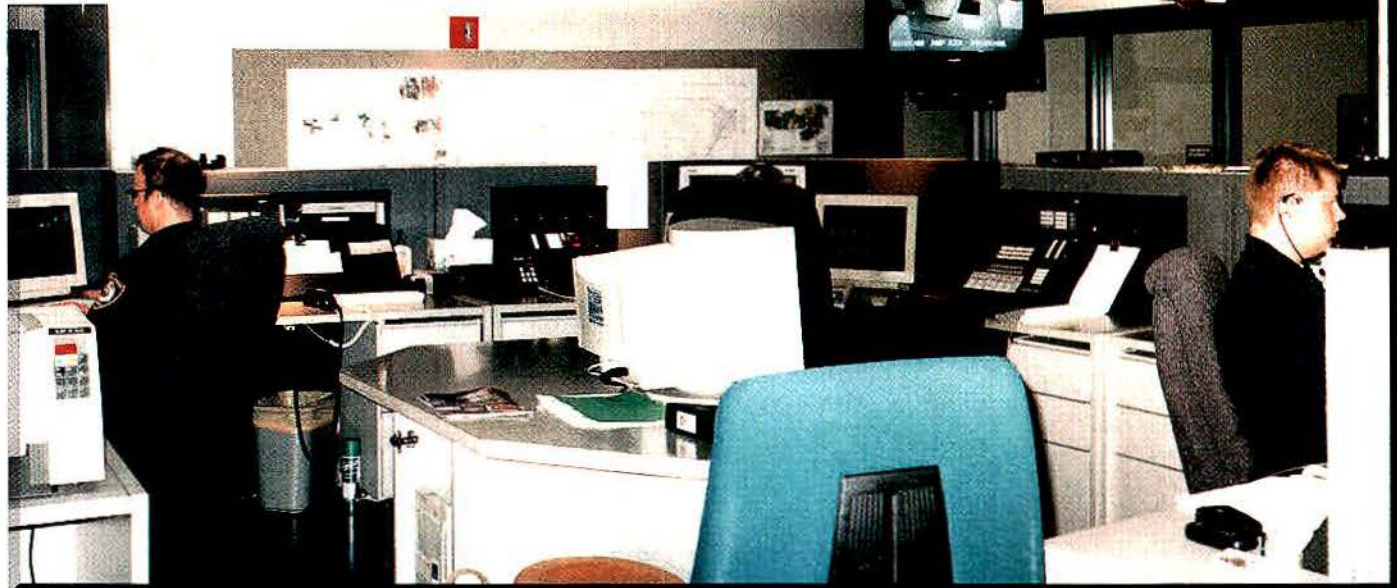
1-800-276-8878
or 402-474-4800



Visit us at APCO, Booth #2331.

Circle (35) on Fast Fact Card

Transcript International and Crypto-Voice-Plus are registered trademarks of Transcript International, Inc. Motorola and HT Series are trademarks of Motorola. ©1999 Transcript International, Inc.



The Lenexa Communications Center has a dispatch position, a records management position and a call-taker position active on each shift.

The longest day

continued from page 32

Lenexa is divided into four districts, with a car assigned to each district before the shift starts. When deciding what to dispatch, Stigall says, you start with the primary car. Any other car that goes along with it goes in the "assist field."

1548: It's almost afternoon rush "hour," the busiest time of the day for the communications center. I notice that each one of the three dispatchers is calm and collected. If the world fell down around them, they would remain just as calm, their voices steady and clear.

"335," Stigall says. *"Respond to a non-injury accident, [location]. It's a blue Explorer and a blue Forerunner."*

We hear dispatch send unit 335 to a non-injury accident. It prompts Bussell to comment on the route we're taking, which he characterizes as "the worst stretch of road in the city," with a deceptive grade and slick conditions during rains. "If there's one accident, you can count on three," he says. Street officers, it seems, are like the salesmen in *The Music Man*: "You've got to know the territory."

On the screen display, Stigall points out radio numbers of the cars and call types. He can also pull up "incidents." Each incident gets a number.

With rush hour approaching, we chat about traffic accident responses. Lenexa is bisected on a southwest to northeast axis, by interstate I-35, which is a heavily traveled commuter route within the metro area. City police are generally the primary responders for any accidents on the interstate, and there is little or no interoperability with the Kansas

Highway Patrol (KHP). Any coordinating communications have to be relayed by Lenexa dispatch through a link to KHP headquarters nearly 180 miles to the west, in central Kansas, which then bounces the information back to area patrolmen. The patrol also essentially stands down at about 2300. "Any vehiculars after 11:30, until about 7:00 in the morning—that's all ours," Bussell says.

The accident situation is often confounded by "Good Samaritans" with cellphones, each with a "unique" description of where the accident has occurred, leaving dispatch to correctly sort out the location.

"But, we get a lot of good 'drunks' [calls] from folks with cellphones. They'll follow them," Bussell says.

1610: A 9-1-1 call has come in regarding a depressed person at a place of business. *"Calling party said she was not suicidal, just wanted some professional help."*

Unit 394 will answer the call.

Lady in distress

1611: We're rolling again, this time to a local business where an employee is having a severe attack of depression. Although suicidal complications are ruled out, her co-workers feel official intervention is needed. We roll up in less than eight minutes, and Bussell enters the business. He is joined by back-up. The two officers counsel the woman, who appears elderly and disoriented, while I watch through the storefront. (I forget to hit the mic monitor switch, so I watch the scene in pantomime.) After a conciliatory conversation, the officers have dispatch summon a Lenexa Fire Department Emergency Medical Response team. Regular patrol officers

have to request fire/EMS services through dispatch, although patrol division sergeant's cars are enabled for fire-and-rescue and public works channels.

It becomes quiet again, so I ask Stigall about the flashing light on the console in front of me. They are testing the 350kW backup generator, like they do every Wednesday. Stigall says that the dispatchers can turn on the generator anytime and transfer the power load themselves. In fact, they will usually switch the power over if there is lightning in the area, instead of waiting for the power to go out. Davidson, who has just walked in, reassures us that the center relies on 45 minutes worth of batteries for backup, along with two UPS systems.

While Davidson is here, I ask him about the homemade CAD system again. "We took the workflow we did on paper and computerized it. We used to take one of those cards, the call-takers would answer the call and hold those cards with the calls, then pass them to the dispatcher," Davidson says that they have had the CAD program since 1985, and 9-1-1 since February 1983. They have been in this communications center for five years.

Something new, something old ...

1755: We listen to radio traffic. Lenexa monitors the adjacent jurisdictions for incident awareness and because officers in this area have cross-jurisdictional arrest authority.

Bussell says he feels lucky not to encounter the coverage problems experienced by some large metropolitan systems: "I mean, this job is stressful. I have a ball coming to work every day, but that's just one less thing to worry about. I know if my portable doesn't work, it's probably because I was stupid

and didn't put it on the charger, or I put it on incorrectly."

Officers are mindful of battery capabilities. "Today I turned in my DPU [portable] radio. It's a special radio, but I don't like it," Bussell says. "One thing is, the battery won't hold a charge for an eight-hour shift—well, maybe eight hours, but if I'm working 10 or 12 hours, it won't hold it. That irritates me."

What was nice about it, and the reason they gave it to DPU, Bussell says, was a scanning capability to track other jurisdictions. Although he says that feature is useful for officers such as the canine unit, which crosses jurisdictions frequently, Bussell finds the feature superfluous because he has a mobile scanner in the cruiser and a private scanner in his own car already. He also had trouble with accidental keying of the radio's mic because of seat belts or other encumbrances, resulting in an open mic.

"I said, 'Give me my old radio back. It works. Its reliable. I like it.' Although the new radio was lighter, and it had a digital readout, performance was what mattered.

Psych tests and psychics

1700: It is getting to be about 5 p.m., and I realize that the only way we know it is daytime is via the security monitors mounted along the back of the room. Each workstation has adjustable lights, but the dispatchers keep them dimmed to reduce the glare on their screens. Eight monitors flash images of the different areas of the police department, including the detention centers, front lobby and entry to the building. The center sits in the basement of the police department, with six workstations and a small kitchen. The dispatchers share lockers with the officers down the hall.

Lenexa Communications has 15 employees, and they do have a hard time finding people to fill empty positions. Davidson cites not only the 1% to 2% unemployment rate as a reason, but also the hiring process. Eleven steps are involved, including a psychological exam and a polygraph test.

"Obviously, we have to know that the people that are in here are honest, trustworthy, reliable people. In just the time we've been sitting here, look at the amount of information they have access to, and the bottom line is not to be overly dramatic. But when someone calls 9-1-1, I'm not the one to decide what we're going to do. It is based, frankly, on their judgment," Davidson says.

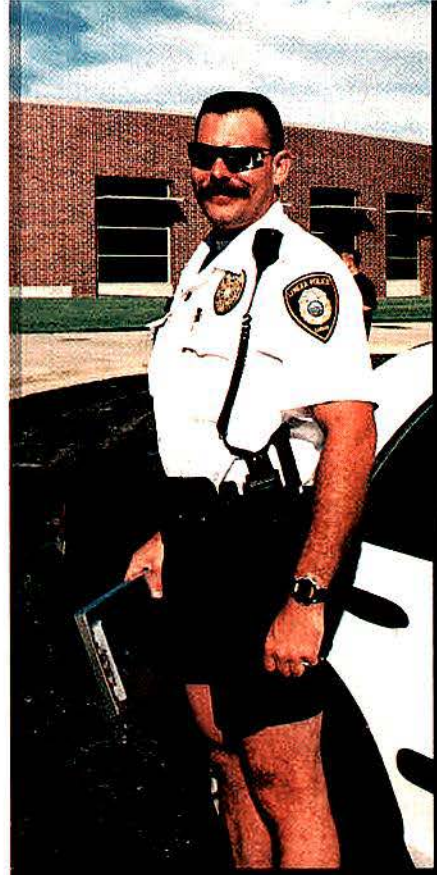
He glances over at Lafary, a blond-haired, petite and mild-mannered woman at the middle workstation.

"Kelly's one of those who reads minds over the phone. I don't know how she does it." Lafary has been taking calls for 18 years. With an average of 20,000 calls a month coming into the center, she has gained a lot of experience. Davidson continues. "It's just that all of a sudden something might not *feel* right or *sound* right about a call, and she just has that intuition. You can't train that."

I ask about accents or foreign language. I think it would be challenging to try to understand some calls for help. They have a solution for that, though: the AT&T Language Line. The call-taker and caller will conference with this line, and the language will be interpreted. The line supports about 150 languages.

Every call has to be answered because you just don't know what is behind each one. That's the main, most important, policy of Lenexa Communications. I ask about other policies. "We have certain 'thou shalt' and 'thou shalt not,' but for every one of those, you could probably think up a whole room full of exceptions to that." He says that they don't want to forget why they are there: "Do the job, answer the phones, take care of the people."

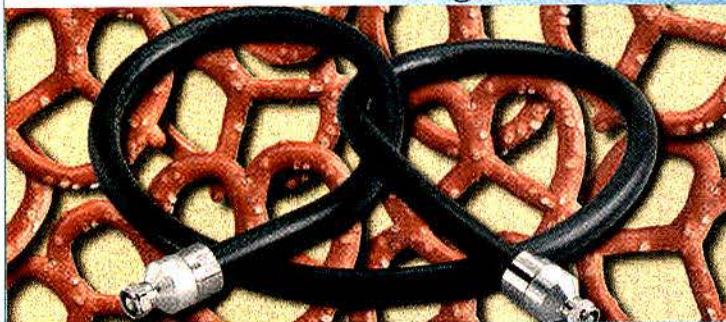
Davidson rises to leave. He has already put in a full day, while our shift is



Bussell, like all active-duty uniformed officers, carries a belt-clipped portable radio, usually a Motorola model HT-1000 or HT600/P200, with an epaulet mic. Officers also carry alphanumeric pagers.

LMR®-900

We Bend Where Corrugated Can't!



Bends like a pretzel! LMR®-900 cable is so flexible it eliminates jumpers in most situations. With a much tighter, non-kinking bend radius than corrugated cable it's the ideal low loss cable for shorter tower runs, rooftops and other difficult installations. Avoid the kinks and additional costly connectors associated with corrugated cable jumper installations — specify LMR®-900.



TIMES MICROWAVE SYSTEMS
A Smiths Industries company



World Headquarters: 358 Hail Avenue, Wallingford, CT 06492 • 203-949-8400, 1-800-867-2828 FAX: 203-949-8423
International Sales: 4 School Brae, Dysart, Kirkcaldy, Fife, Scotland KY1 2XB UK • +44(0)159265428 FAX: +44(0)1592653162
www.timesmicrowave.com

CIRCLE (36) ON FAST FACT CARD

not even half over. The usual shifts are 3-11, 11-7 and 7-3. The shift from 3 p.m. to 11 p.m. is "60% of our business," according to Davidson. The schedule is made for each month, and employees sign up for the shift they want, by seniority.

Now, my assignment shifts. I join Stancer, who is still taking calls. I take my headset and plug into his workstation. Davidson warns me that we never know what is going to come through the line, and I agree to report discretely.

Goose chases and chicken runs

1751: We return to the station. Bussell has been reassigned to undercover surveillance, so he will be leaving uniformed patrol duty for the rest of the night. Ofc. Brad Rechtfertig agrees to accept me as his ridealong, and I switch cruisers to join unit "336."

Rechtfertig, in his mid-20s, is reddish-haired, ruddy, wiry and, like Bussell, loves being a cop. He has served six months with Lenexa, following about two-and-a-half years with the police department in nearby Roeland Park, KS. Although he prefers the traditional black uniform, he also prefers rock music from the dash FM radio while he works. This doesn't interfere with receiving

dispatches because the radio system automatically mutes the dash radio whenever there is communications traffic. Rechtfertig's cruiser is equipped identically to Bussell's unit, with the addition of a dash-mounted Silver Eagle traffic radar display in front of the steering wheel. His laptop remains open, and a sea-scene screensaver gurgles softly under the wash of radio activity.

1758: After about seven minutes to get acquainted, we get a dispatch to back up an attempt to secure a juvenile female runaway. A 17-year-old is suspected to be holed up at her boyfriend's family home, and dispatch advises that she has been sought previously and is likely to bolt out the back door. We park about a block away from the address, and officers 335 and 337 join Rechtfertig on foot as they maneuver themselves into strategic positions to intercept a possibly fleeing teenager.

1811: Three Lenexa units are working a runaway call. It comes through the radio that the officers are circling the house and setting up a perimeter where the runaway may be hiding.

The placid Stancer says, "You could actually get a footchase here. Virgil is 'preparing' himself. In a footchase, you have to know where everybody's at." In

other words, Stigall has to follow everyone's movement through the radio.

An officer runs a tag of a car sitting at the house. "They want to get as much information as they can before they go in," says Stancer.

The officers coordinate their positions using their portable radios and epaulet mics. Communication only breaks once when one officer gets too near a metal garden shed. The house is apparently empty, but the boy's father arrives home and the officers' communication skills revert to written when they discover that he is deaf. Their inquiries must be scribbled on the handy pocket note pad.

After 20 minutes, the operation is canceled. No girl. Just a wild-goose chase.

1817: It's getting close to dinnertime, and Stigall talks about getting something to eat. The Lenexa dispatchers do not take breaks. They eat at their workstations while taking calls and dispatching. Things are starting to slow down now, though. Rush "hour" is almost over. I look at the security monitors—still bright outside. Shouldn't it be dark by now? No, it's only 6:17 p.m., and another call rings into Lenexa P.D.

"Communications," Stancer answers. The call is from a bondsman. "The bondsman is going to pick up one of his subjects; has to go out to Merriam; he wants an officer to go with him to make contact," Stancer says to Stigall through the radio. The subject works at a fast food chicken chain and is supposedly at work now.

"I was thinking about going [there] tonight," Stigall says.

"Really? Maybe you ought to go right now—before they arrest him," Lafary suggests. So Stigall takes orders and heads out the door.

1842: Rechtfertig is called back to the station to pick up a bench warrant. We are headed south to Olathe, KS, where Rechtfertig is to arrest a man for non-appearance in court and to convey him to the county lockup. As we drive down, I ask about his interaction with his radio equipment. One criticism he has of standard uniform radios is the epaulet mic, which he says can flop and slide too much during foot pursuit. What he would prefer is an in-ear plug with a mouth-level boom mic.

1859: The arrestee offers no resistance, and compliantly allows himself to be handcuffed and transported to jail. Processing, though, takes some time.

2018: Back in town and patrolling freely, Rechtfertig encounters a motorist, truck hood up, stalled at an intersection. Pulling behind this apparently



Chargers

- NiCd
- NiMH
- Lithium Ion
- Lead Acid

Analyzers

Batteries

www.advanced-battery.com

Advanced Battery Systems, Inc.
Holbrook, MA
(800) 634-8132 Fax (781) 767-4599
e-mail: periphex@aol.com

CIRCLE (37) ON FAST FACT CARD

innocuous scene, he still goes by the book, running a tag on the vehicle and setting his camera before he steps out to assist. I observe from my vantage point in the front seat how effective this tool is, taking in everything that transpires. Rechtfertig uses his front push bumper to move the vehicle out of the intersection, and the motorist takes it from there, using his own cellphone to get a tow. A five-minute assist from Officer Friendly.

Stigall returns shortly with three-piece chicken strip meals. He says he didn't see whom he thought was going to be arrested. The subject may have been in the back, or in the parking lot.

As the dispatchers eat dinner, we discuss the ergonomics of their furniture. "I like the stand-up consoles," Stigall says. "I like to raise the monitor to eye level."

The calls are coming in less often now, so Stigall takes the opportunity to clean up the work area, and Stancer and Lafary do some paperwork.

2025: I contact Chandler on my own cellphone. It's long past the end of our workday, and she's heading for home soon, but it's about "lunch" time for third watch. Rechtfertig turns down my offer of a free meal. Like the dispatchers, he prefers to stay in-service during his shift. "Lunch" is an orange from under the seat and bottled water from a local convenience store. While parked there and supping with one hand, his other is busily running the Versadex v17.1 software on his laptop, checking the out-of-state tags on cars gassing up for possible ticket skips, a frequent occurrence in a state line region. A out-of-towner approaches, and it's Officer Friendly time again, giving driving directions.

Energizer bunnies

2001: I walk out of the police department at 8 p.m., but the sun still shines. The dispatchers continue their noble work on the inside, communicating with police officers, citizens and each other, all at the same time. "We've got all this technology," Davidson has said. "Bottom line is—this job still entails us talking to each other."

2020: Rechtfertig patrols for a while, then pulls into an alley near a local hotel on the interstate that has been the site of prostitution incidents. I marvel at the young officer, who simultaneously fields my questions; watches and listens to his scanner and to his favorite FM station; keys-in his incident reports; and, I discover, has been running three tag checks while talking to me. I envy his faculties and aptitude. Maybe all those parents

Home base: the Lenexa Police Department, attached to City Hall, is a five-year-old facility.

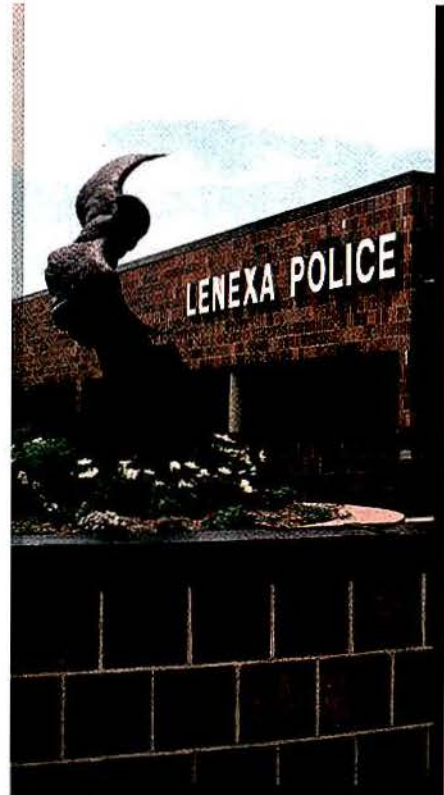
who complained about kids doing their homework while watching television or listening to music didn't realize we were breeding a generation of multiple-sensory-input wunderkinds.

2105: I'm all-in for the day. Rechtfertig has two hours to go, and he suggests that I call it quits. "This is the time of night that the next call you get will keep you out until midnight," he jokes. He returns me to the station and I thank him for indulging us. As he drives off, I, like Sgt. Esterhaus on *Hill Street Blues*, I hope the young man will "be careful out there."

The human factor

What did we learn today? Lenexa is blessed, compared to other mid-size cities, with top-of-the-line equipment. However, the success of public safety mobile radio communications is not measured by how much it costs, or how well it is supported and advanced by APCO, radio manufacturers, government officials, technicians or industry technical journals. It is measured by how well it serves *three* people: the victim/citizen requiring assistance, the PSAP operator/dispatcher who is the

lifeline, and the officer who renders that assistance. The other thing we observed is teamwork and personal excellence. The equipment only reaches its potential if it is put into the hands of people who can use it effectively. ■



TIMES



Connectors

For the best performance from your LMR® flexible coax cable use the best connectors available — Times LMR® connectors. Engineered and manufactured to the highest standards, LMR® connectors offer unsurpassed electrical performance combined with ease of installation. Times "EZ" non-solder, high performance connectors provide quick installation and long-term reliability. Available in a wide variety of interfaces, we have the right connectors for your application. Specify Times LMR® connectors — accept no substitute!



TIMES MICROWAVE SYSTEMS
A Smiths Industries company

World Headquarters: 358 Hall Avenue, Wallingford, CT 06492 • 203-849-8400, 1-800-867-2629 FAX: 203-849-8423
International Sales: 4 School Brae, Dysart, Kirkcaldy, Fife, Scotland KY1 2XB UK • +44(0)1592655428 FAX: +44(0)1592653162
www.timesmicrowave.com

CONNECTORS

CIRCLE (38) ON FAST FACT CARD

Give me interoperability
or give me death.



Sadly, the lack of radio interoperability costs lives.

Virginians, like Patrick Henry, have always known when it's time to draw the line. In 1775 Patrick Henry stood in a small Virginia church and uttered those famous words that helped change the course of the American Revolution.

Today a group of communications experts in Virginia, forced with a mounting radio challenge, have also

said "enough." **No more** conciliation to those who would spurn shared networks in order to sell the public more equipment through

fragmented systems. **No more** appeasement of monopolistic practices. We're leading the charge for interoperability on behalf of our customers and those they protect. We know not what course others may take, but as for Com-Net Ericsson, give us interoperability or give us ...

If you want to join the fight for interoperable solutions that give public safety agencies the ability to establish direct communications between users, realize cooperation, mutual aid and partnerships — utilize your right to choose greater efficiency in critical communications. Choose Com-Net Ericsson.



Patrick Henry
1775



Come see us
at APCO,
Booth #1416



ComNet Ericsson

CRITICAL RADIO SYSTEMS

P.O. Box 2000, Lynchburg, VA 24501 www.com-netericsson.com

Circle (39) on Fast Fact Card



Photo 1. The Danko hummer is just the ticket for fast reaction firefighting.

Fire vehicle installation

Radio installations in specialty firefighting vehicles are challenging enough, but this one's a real hummer.

By Donald Koehler

Every mobile installation carries some minimum requirements, but some installations require a bit more thought. Every installation requires planning and some time with the users to ensure that you meet their needs, that safety items are covered and that aesthetics are reasonable. This article describes some pitfalls to avoid using as an example a recent installation in a piece of special-purpose, fire-response equipment.



Photo 2. The engine compartment is not a good choice for mounting equipment.

Although most of this discussion is targeted toward police, fire and EMS vehicle installations, many of the principles apply for commercial fleet dispatch vehicles as well.

► **Safe inflation** — Passenger safety should

be your number-one priority. Examine the manufacturer's technical bulletins or contact the dealer to establish the air bag *inflation zone*. This is a zone to be kept free of equipment or mounts so the passive restraints (air bags) can deploy as designed. Anything placed within these zones poses a potential danger to the occupants of the vehicle. The airbag could deploy and strike equipment, thrusting it violently aside and into an occupant, with resultant injury. Or, worse, equipment within the zone could puncture the airbag and render it useless. Both alternatives are unacceptable.

► **Heavy metal** — Equipment mounts have become more problematic as vehicles have become lighter and smaller. Reinforcement plates for the underside of floor or firewall mounts should be considered when large arrays of equipment are to be mounted on a single pedestal. Even fairly thick aluminum can be roughly formed with a rubber mallet to provide a sturdy mounting surface following the contours of the underside of

the vehicle floorboards or the firewall. Some police patrol officers also insist that equipment be moveable so that they can quickly exit the vehicle from the curb-side door in an emergency. This type of mount should still have a positive lock to prevent loss of the equipment, or injury to occupants, if a sudden stop or collision should occur.

► **Distributing the juice** — Electrical safety is next on the list. I have always strongly recommended running positive and negative lines from the battery and fusing them at each end of the line. This is a bit more trouble and more expen-

Contributing editor Koehler has more than 30 years of experience in radio, telephony and computer electronics. He has been teaching part time at the University of Alaska, Anchorage, for the past four years. His email address is AFDEK1@uaa.alaska.edu.

The author thanks Engineer Albright and Firefighter Gliori, some of the professionals at the Anchorage Fire Department, Station 12, for access to the "Brush 2" equipment. They were literally "between fires" and were gracious enough to answer questions.

Photos used courtesy of and copyright by Tec Images Alaska.

sive, but it allows greater safety and the option to bond the power line to prevent sneak circuits. Running power lines underfoot to the trunk requires protection from abrasion; running them through the overhead requires bracing to prevent sags. All controls should feed to a central point. This is the pay-off from your planning and discussion with the user. A central control point may be hard to achieve with multiple control heads, but it improves operator safety.

► **A clean look** — Aesthetics of equipment installation may seem a strange concept at first, but if you think about it, it makes sense. Fabricating a rack for mounting multiple control heads, for example, not only improves the "look" of the installation, it protects the equipment cables from damage. If you are lucky, all of the required equipment will be installed at one time, allowing for a single dc power run with fuses mounted and marked and control and power cables laced together and tagged at both ends. Not only does this look professional, it aids in any future troubleshooting or equipment repair.

A humdinger of an installation

To demonstrate this point, Photos 1-6 show the integration of form and function in the Anchorage Fire Department's new "Brush 2" off-road firefighting vehicle. Based on an AM GENERAL HMV (hum-vee) from Danko (www.danko.com), this fire truck is designed to go off road to knock down urban brushfires. (If you have not been to Anchorage, you may be surprised at the amount of forestation within the city.) The vehicle is equipped with a Motorola trunked radio system, a cellphone and the standard siren/lightbar



Photo 3. The lightbar and antenna are a clean install.

needed by emergency vehicles. The vehicle carries a crew of two—a firefighter and an engineer—so reliable communi-

cations is critical to crew safety.

Photo 2 on page 50 shows how the hood lifts forward to expose the engine, which is

While your communications center may only have one or two radio dispatch positions, your need for dispatch console performance is every bit as critical as those of a larger center.

A richer feature set, greater flexibility, and rock solid "7/24" reliability clearly separate Zetron's Model 4010 from the competition.

A built-in controller and up to 12 radio interfaces make the Model 4010 the perfect solution for smaller communications centers.

All this at a price that may surprise you. The Model 4010 is in service throughout the world, helping police, fire, and EMS agencies protect their neighbors' safety and quality of life. Thousands of small communities have put their trust in Zetron. You can too.



Model 4010

Small town values. Big city performance.



Zetron, Inc. PO Box 97004, Redmond WA 98073-9704 USA
Ph: (425) 820-6363 Fax: (425) 820-7031
Email: zetron@zetron.com Web: www.zetron.com



Photo 4. Interior space is at a premium.



Photo 5. The engine compartment is relatively unprotected.

mounted partly in the crew compartment. The engine compartment is both open and relatively unprotected (Photo 5 above), so it makes a poor choice for mounting communications equipment. The engine mounting takes up considerable room, and with the battery container mounted right behind the engine, space is hard to find. To further complicate matters, the cab roof is low (no doubt a holdover from the military specification for the vehicle). While the design does aid the firefighters while off-road, it almost certainly rules out a roofmount radio or control panel. The areas behind or under the seats are poor choices for an easy mount as well.

The radio shop has done a good job in mounting the communications equipment where both crewpersons can operate the



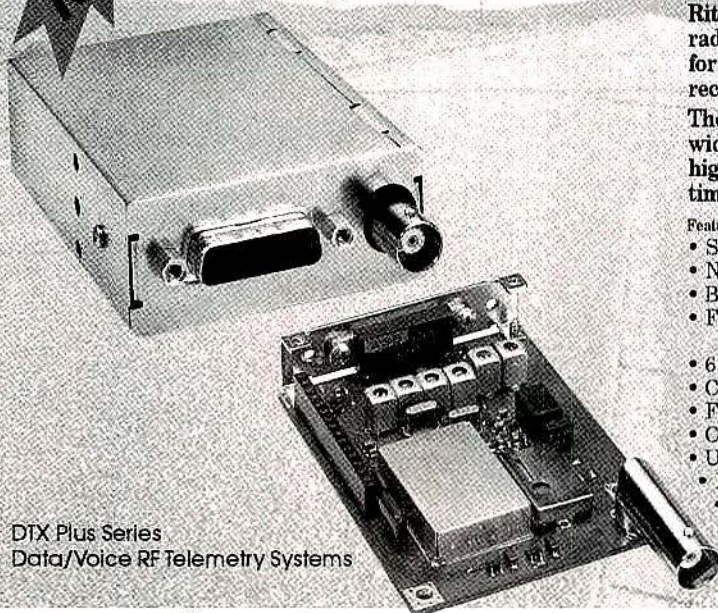
Photo 6. The on-board, gasoline-powered pump can be a source of interference.

controls and still maintain visibility of the road. The power cable is routed under the cowl and mated up to the battery with nothing to snag or catch as the crew enters or exits the vehicle. Bonding is good, and necessary in this instance, because the truck is equipped with a 305-gallon water tank and small gasoline powered pump. The roof-mounted antenna and lightbar is

clean, leaving no cables to snag tree branches while off road.

Plan ahead, talk to the user and run power cables for both sides of the dc feed, with fuses on each end. Take the time to bundle and mark cables and fuses and document the installation, and the end result is a reliable, professional installation. ■

NEW! The Data Radio YOU choose will make or break your wireless system . . .



DTX Plus Series
Data/Voice RF Telemetry Systems

Ritron designs and manufactures Data/Voice RF Telemetry radios for systems demanding the utmost in performance for over twenty years. In fact, since 1977 Ritron has been a recognized leader in Wireless Data solutions.

The synthesized DTX Plus Series, available in narrow or wide band, is ideal for any OEM system designed where high performance RF specifications, ultra fast TX/RX attack times, and small size are a requirement.

Features:

- Synthesized and PC Programmable
- Narrow band (12.5 kHz) or wide band (25 kHz) models
- Broadband TX/RX design: 26 MHz VHF, 20 MHz UHF
- Frequency ranges: VHF: 136-174 MHz
UHF: 400-470 MHz
- 6 Watt (VHF) and 3/6/10 Watt (UHF) models
- Channel Steps: 2.5kHz (VHF) and 5/6.25 kHz (UHF)
- Frequency Stability: 1.5 ppm
- Compact Size: 3.6" x 2.3" x 1.0"
- Ultra Fast TX/RX Attack Times
- Electronic Alignment Capable
- Dual TX/RX Audio Paths
- Controlled Envelope™ TX Keying
- Programmable High/Low Output Power

so choose

RITRON®



www.ritron.com

Ritron, Inc., 505 West Carmel Drive, Carmel, IN 46032 • Phone: 317 846 1201 • FAX: 317 846 4978 • Email: ritron@ritron.com

800-USA-1-USA

Ritron is a registered trademark of Ritron, Inc.

CIRCLE (41) ON FAST FACT CARD

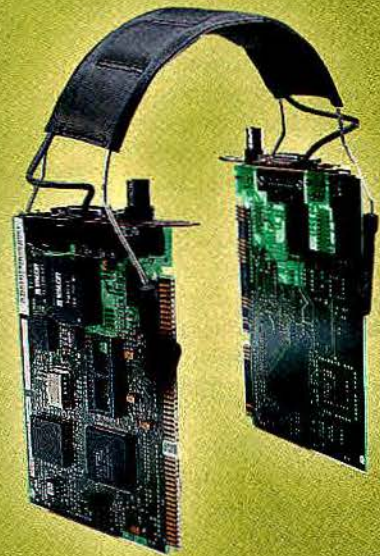
Introducing the Peltor line of two-way communication headsets. As the best-designed line of communication headsets for noisy environments, and the number one selling headset in Europe, the Peltor name not only means comfort and protection, but the recent acquisition of Norhammer means we've also got the expert technical support to back it up. So, it would seem high customer satisfaction is now available to you as well. For more information, call 1.800.665.2942.

PELTOR[®]
COMMUNICATIONS

Circle (42) on Fast Fact Card



SCANDINAVIAN DESIGN



RELIABLE TECHNICAL SUPPORT



ALL-DAY COMFORT



NOW AVAILABLE TO TWO-WAY RADIO DEALERS

Putting Project 25 to the test

To reap the advantages of multiple sourcing under an open standard, public safety systems operators and technicians will require broader testing capabilities.

By Bill Burrows

As the deployment of Project 25 systems gathers momentum, the requirement for system-specific test equipment is becoming apparent. Measurements that need to be made at the air interface during deployment and operation of a Project 25 system require new measurement technology. Additionally, the open standard raises the issue of interoperability among equipment purchased from different sources. Interoperability problems can be minimized with appropriate test strategies.

New testing challenges

Operators and maintenance technicians are focusing considerable attention on the implications of the Project 25 standard for their support and maintenance programs. Because interoperability and maximization of radio spectrum efficiency are fundamental requirements, Phase I of Project 25 uses digital voice encoding to reduce the required bandwidth for speech transmission to 12.5kHz, while simultaneously maintaining backward compatibility and interoperation with the existing 25kHz analog FM systems. Supporting both digital and analog testing, although common in the cellular world, is a new requirement in the public safety communications environment.

Traditional test strategies have primarily focused on the parametric performance of the radio terminal, where measurements such as power, frequency, modulation and sensitivity are the primary indicators of performance. The open-standard concept adopted for Project 25 introduces some new variables into the testing equation that relate to the interoperability of equipment sourced from multiple

manufacturers supporting the standard.

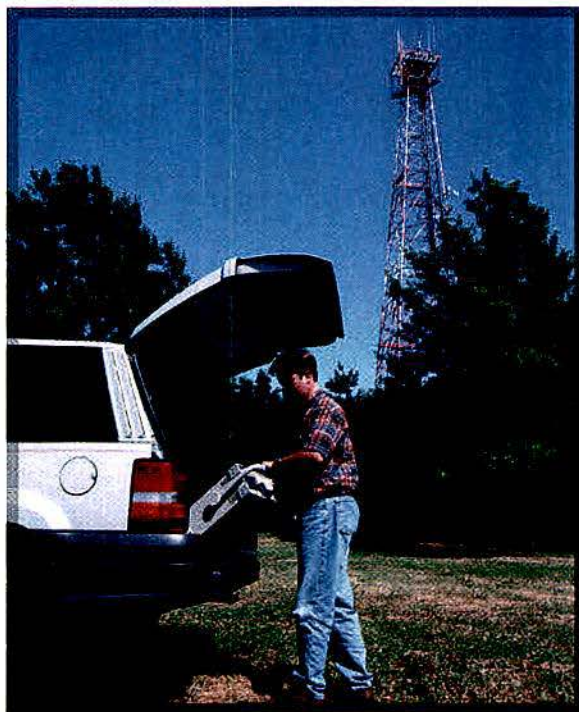
The Project 25 standard, like its analog predecessors, is based on a frequency-domain multiple-access (FDMA) system, and it produces continuous signals when the radio is keyed. Therefore, some of the more complex measurement techniques required for time-domain multiple-

to provide a data stream of all low-deviation symbols or all high-deviation symbols, thus enabling the high 61.8kHz and the low 60.6kHz deviations to be measured. This is not practical on a working transmitter because the data content cannot be controlled without removing the transmitter from service, so a new measurement technique has to be used. This requires sampling the transmitted signal and demodulating the data. The demodulated data are used to compute the instantaneous deviation from a "perfect" modulator. This deviation is then compared with the actual measured deviation value, and a root-mean-square (RMS) error magnitude is calculated. This error is expressed as a percentage from the perfect signal. A typical transmitter test screen from a radio test set is shown in Figure 1 on page 57.

Bit-error rate measurement

Receiver sensitivity for digital systems is measured by determining the bit-error rate (BER), which is defined as the number of bits received in error expressed as a percentage of the total number of bits received. This measurement is not quite as simple as it sounds because it depends on where the measurement is taken within a given radio system. Of

the total throughput of a Project 25 channel of 9,600bps, only 4,400bps are associated with the digital voice. Of the remainder, 2,800bps are used for error correction of the voice signal and 2,400bps are devoted to signaling overhead. The question arises: Do you measure the errors *before* or *after* correction? Obviously, it is the *corrected* performance that is important to the user because this determines the intelligibility of the speech. To overcome the uncertainty of



Test equipment needs to be easily transportable to a base station site by a lone technician.

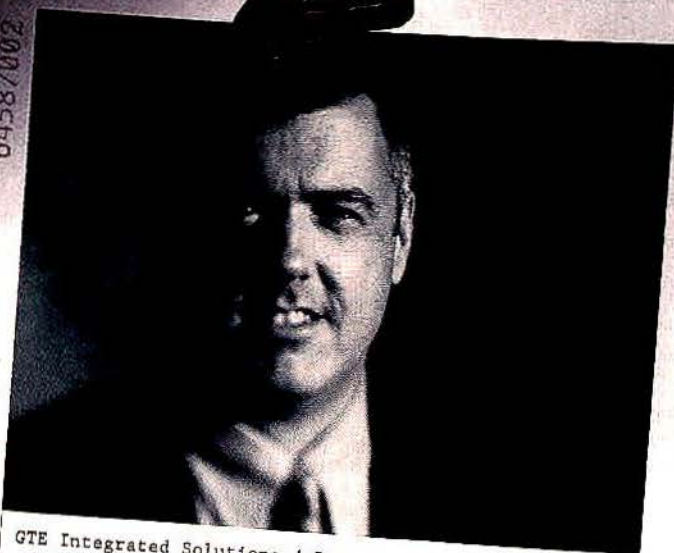
access (TDMA) systems, such as Terrestrial Trunked Radio (TETRA), are simplified. The significant differences occur in modulation and sensitivity measurements.

A new approach

The modulation selected for Project 25 is *C4FM*, which is a modified, four-level, frequency-shift keying (FSK), with a raised cosine filter for minimizing intersymbol interference. The modulation can be measured using conventional techniques as long as standard test signals are used. These signals are designed

Burrows, an electrical engineer, is director of product marketing for IFR Systems, Wichita, KS.

64587002



GTE Integrated Solutions / Project Manager

PROCESSED

64587002

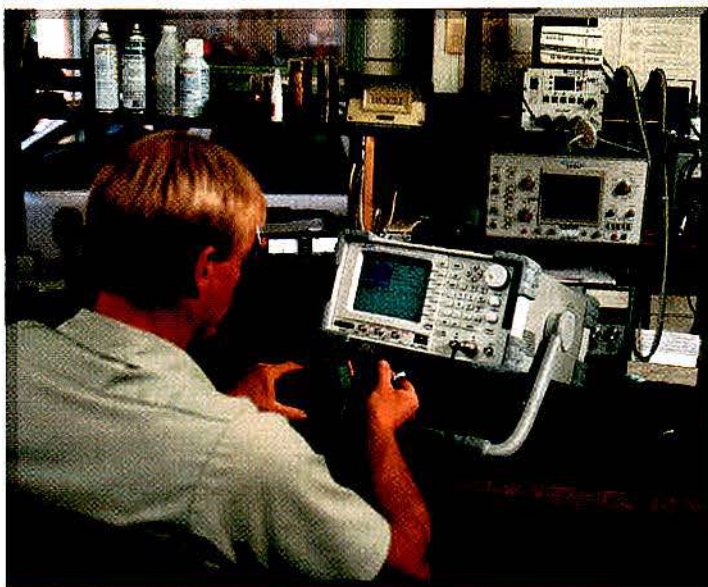
He doesn't know CPR, has never
set a broken bone and gets
queasy at the sight of blood.
You need this guy on your team.

He works at GTE. The only company designing, installing, supporting and guaranteeing fully integrated public safety systems for agencies like yours. When your current public safety system goes down, it's not just an emergency - it's a potential catastrophe. But, with multiple vendors, who do you call? With the GTE system, getting help is almost as easy as dialing 911. Call 1-888-GTE-9134, and you'll get the assistance you need. With no finger pointing. No excuses. And no wasted time. Just immediate response to solve the problem - no matter where it is in the system - from the people who already know every customized inch of it. In your business, lives are constantly on the line. With GTE on your team, you'll never miss the call.

GTE

PUBLIC SAFETY

Public Safety Integrator
64587002



Project 25 adoption will require the capability to test equipment from a variety of radio equipment manufacturers.

this measurement, a test signal with a known bit pattern is defined. A BER compares the received signal with the expected test signal. Nominal BER for a Project 25 receiver is 5%.

An alternative measurement of receiver sensitivity is a recorded speech pattern, which gives an audible indication. Because of the large

amount of error correction used, its failure point occurs abruptly, so sensitivity measurements are accurate.

Additional measurements are specified, such as adjacent channel power and emission spectrum, to ensure that Project 25 equipment does not interfere with, or degrade the performance of, equipment on co-existent analog channels. Although these measurements are important to overall system integrity, they are not commonly used for routine system maintenance. They also require performance levels that are only obtainable with specialized test equipment.

amount of error correction used, its failure point occurs abruptly, so sensitivity measurements are accurate.

Additional measurements are specified, such as adjacent channel power and emission spectrum, to ensure that Project 25 equipment does not interfere with, or degrade the performance of, equipment on co-existent analog channels.

How interoperability impacts testing

Although the open standard creates many benefits for the user in the long term (i.e., reduced equipment costs and greater customer choice), it does introduce another uncertainty: Will the equipment from different suppliers work together seamlessly?

The standardization process is designed to create a standard that defines all aspects of the system operation. It is possible however, that equipment suppliers will interpret the standard in differing ways. This may result in a terminal from one manufacturer and a repeater from another not interoperating as expected. Additionally, as new features become available on a system and the equipment is updated, the need to reassess interoperability may occur. This will gain in significance as the number of compliant-equipment manufacturers increases.

Two test strategies can be used to determine interoperability. The first method is to test each new equipment type with all of the existing equipment used in the network. Obviously, not all of the terminal features on all of the user channels can be tested because the testing time would escalate rapidly. If the number of units in a system is large, even basic interoperability tests would

DESKTOP POWER SUPPLY with BATTERY BACK-UP



Combine one of our low profile desk top LP Series power supplies, a suitable battery, and one of our LPBB solid state battery backup modules to provide a compact, easy to install, low cost UPS.

- 4 LP models available, peak output rated from 10 to 25 "Amps".
- Compact size, 1.75"H x 7"W x 7.62"D.
- LPBB provides seamless solid state transfer to battery power when AC mains go down. Float charges the battery when power is restored.

Contact your communications distributor, or call or fax us Toll Free

Phone 1-800-467-6741 Fax 1-800-825-1403

DuraComm®
CORPORATION

203 W. 23rd Ave.
North Kansas City, MO.
64116

On the Web at www.duracomm.com
Email: duracomm@duracomm.com

WIND POWER

Enhance your PV system with **AIR Industrial**

Benefits

- ✓ Power night and day
- ✓ Reduce seasonal fluctuations
- ✓ Reduce total system costs

Monthly Average Output

- ✓ 9 mph average: 15. kWh
- ✓ 10 mph average: 22.3 kWh
- ✓ 11 mph average: 29.6 kWh

Specifications

- ✓ Rated 400 watts
- ✓ Only 14 lbs. (6.3 kg)
- ✓ 45 inch (1.14 m) blade dia.
- ✓ Only two moving parts
- ✓ Internally Regulated

3 Year Warranty



For distributor and product information, contact:

Southwest Windpower

2131 N. First Street • Flagstaff, Arizona 86004 USA
Tel 520-779-9463 Ext. 400 • Fax 520-779-1485
www.windenergy.com • E-mail: info@windenergy.com

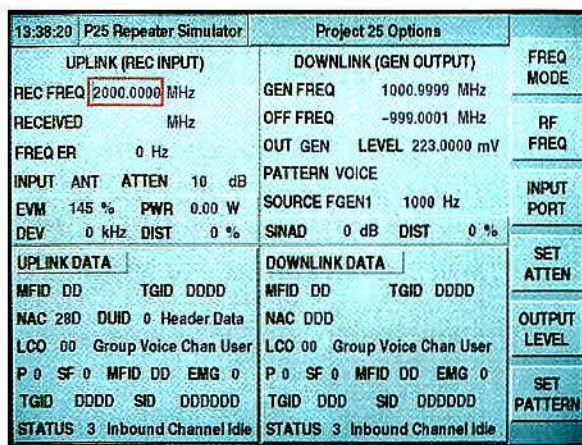
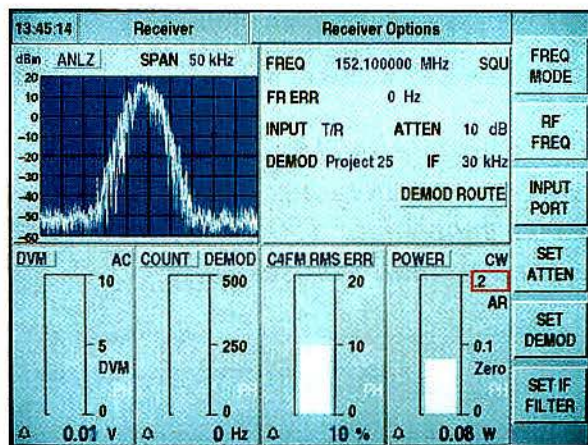


Figure 1 (far left). A typical transmitter test screen from an IFR Systems model 2975 radio test set. Figure 2. (near left). A system parameter measurement screen.

require a tremendous number of combinations. This approach ensures that the equipment will interoperate, but it does not guarantee adherence to the standard—nor does it necessarily indicate which equipment is non-compliant.

An alternative approach is to check all equipment against a reference system or device. If it were practical to use only one reference system for all tests, then this system would itself become the standard. Typically, a radio test set could be used as the reference, but, again, this is based on one manufacturer's interpretation of the standard. Also, the number of functions that can be tested is limited by the reference system capability. This method significantly reduces the number of tests required, but interoperability will only be implied—not guaranteed.

Test equipment for a robust standard

A radio test set provides the tools required to maintain radio systems. Traditionally, these instruments have provided sufficient control of the device-under-test (DUT) for parametric measurements to be made in a normal system environment. Project 25's emphasis on interoperability raises the capability threshold in two significant ways. First, it requires the test set to provide a comprehensive simulation of the radio system and to analyze the data it receives back from the DUT. A system parameter measurement screen is shown in Figure 2 above. Second, the user must be enabled to configure the test set to accurately represent the system being operated.

Reaping the benefits of a standard

Adoption of Project 25 will require radio systems operators and maintenance technicians to revisit their testing capabilities. Accurate testing of equipment offered by a variety of competing manufacturers will enable public safety users to use the open standard to its fullest advantage. ■

The leader in PC-based wireless planning tools.

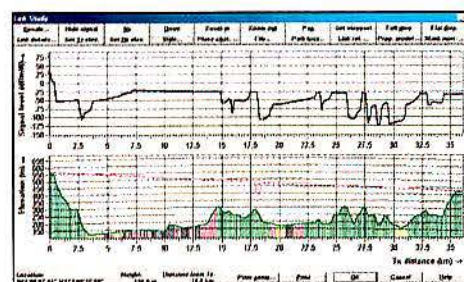
Set Your Sites

WITH EDX

Only EDX offers you advanced wireless planning tools that can meet the needs of the simplest or most sophisticated system. Cellular, PCS, paging, mobile radio, LMDS and broadcast systems throughout the world have been successfully designed and optimized with EDX planning tools.

With powerful GIS data capabilities, EDX tools can also support your wireless business from initial design through long-term operation.

For 14 years EDX has been the leader in PC-based wireless planning tools. Contact us today for more information and a fully operational demo CD.




EDX
Tools for Wireless Design

EDX Engineering, Inc. • P.O. Box 1547 • Eugene, OR 97440-1547 USA • Tel: (541) 345-0019
Fax: (541) 345-8145 • E-mail: info@edx.com • Web: www.edx.com






CIRCLE (46) ON FAST FACT CARD

AUGUST 2000 MOBILE RADIO TECHNOLOGY 57

The 66th Annual APCO Conference, to be held in Boston Aug. 13-17, will cover topics such as TTY training, the new 700MHz band and applications of the TETRA standard to public safety. Attendees will be able to visit more than 150 exhibitor booths at the Hynes Convention Center and attend more than 100 sessions.



APCO officers

 President Joe Hanna		 President-Elect Lyle Gallagher	
 First Vice President Glen Nash	 Second Vice President Thera Bradshaw	 Candidate Vincent Stile	

Stile is a 'shoo-in' for second vice president

Just as the race for the U.S. presidency is hitting its stride, Vincent Stile will walk unopposed into the office of second vice president at APCO's 66th Annual Conference & Exposition. He is running uncontested and will be sworn in on Aug. 17.

Although Stile said he is somewhat surprised that he is the only candidate running for the office, he acknowledged that being an officer is a large undertaking.

"The large commitment of time is difficult," Stile said. "It's a four-year process to go through the system."

Although he says he is "learning the ropes" as he goes, Stile is confident his background will help him fulfill his duties.

"Experience plays a good part in APCO," he said. "My background has been in technical areas, so I

believe I can take on any challenges that come my way."

As a member of APCO since 1969, he has served on the APCO Regulatory Advisory Committee, and he was president of APCO's Atlantic Chapter from 1995 to 1996.

In his professional life, Stile has coordinated the planning and design of trunked radio, conventional, microwave and mobile data systems as police radio communications director for the Suffolk County (NY) Police Department.

As for his future with APCO, Stile is optimistic.

"I consider myself a traditionalist," he said. "We can build upon the organization's past successes and bring them forward with traditional ideals."

—MH

General Information

Awards program

The annual APCO International Awards Program will take place during the opening session on Monday, Aug. 14. The program salutes the Public Safety Telecommunicator, Communications Center Director, Line Supervisor and Technician of the Year.

APCO pavilion

APCO will sponsor a pavilion in the exhibit hall again this year. If you would like more information on APCO International, stop by.

Audio tapes

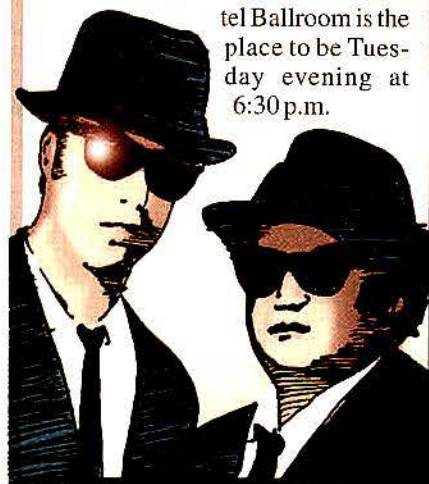
Conference sessions will be audio taped. Only those presenters who have given their consent will have their seminars taped. Audio tapes of the seminars and sessions may be purchased.

Straight from Joliet Correctional Facility

Jake and Elwood Blues are back, and their new "mission from God" is to entertain APCO 2000 attendees.

MANAPCO Night will feature The Jake and Elwood Blues Review along with the Fabulous Blues Brothers Tribute Band: "Tremors," featuring "The Earthquake Horns."

The Sheraton Boston Hotel Ballroom is the place to be Tuesday evening at 6:30 p.m.



Original photo provided by wolfsmanjack.com

Monday, Aug. 14

7:00 a.m. – 6:00 p.m. Registration
 8:00 a.m. – 5:00 p.m. AFC Advisor Refresher Training
 8:30 a.m. – 9:15 a.m. New Attendee Orientation
 9:30 a.m. – 11:00 a.m. Opening General Session/Featured Speaker
 Noon – 1:30 p.m. Opening Luncheon/Keynote Address & Featured Speakers
 Noon – 5:00 p.m. Exhibitor Booth Selection Appointments - 2001
 1:45 p.m. – 3:15 p.m. FCC Regulatory Panel

Tuesday, Aug. 15

7:00 a.m. – 6:00 p.m. Registration
 8:00 a.m. – 10:15 a.m. First General Business Session
 8:00 a.m. – 5:00 p.m. AFC Advisor Refresher Training
 9:00 a.m. – 5:00 p.m. Exhibitor Booth Selection Appointments - 2001
 10:15 a.m. Grand Opening of Exhibits
 10:30 a.m. – 1:30 p.m. Exclusive Exhibit Hours
 10:30 a.m. – 4:30 p.m. Exhibits Open
 10:30 a.m. – 5:30 p.m. Voting - Second VP (Exhibit Hall A)
 1:00 p.m. – 3:00 p.m. AFC Advisor Luncheon
 1:30 p.m. – 3:00 p.m. APCO Meet the Press
 1:45 p.m. – 2:45 p.m. Concurrent Sessions
 6:30 p.m. – 11:00 p.m. MANAPCO Night

Wednesday, Aug. 16

7:00 a.m. – 5:00 p.m. Registration
 7:30 a.m. – 9:00 a.m. Chapter Representatives/Breakfast Meeting
 8:00 a.m. – 9:00 a.m. Concurrent Sessions
 8:00 a.m. – 5:00 p.m. AFC Advisor Refresher Training

9:00 a.m. – 5:00 p.m. Booth Selection Appointments - 2001
 9:15 a.m. – 10:15 a.m. Concurrent Sessions
 9:30 a.m. – 11:30 a.m. Chapter Presidents/Secretaries Workshop
 10:30 a.m. – 1:30 p.m. Exclusive Exhibit Hours
 10:30 a.m. – 4:30 p.m. Exhibits Open
 Noon – 2:00 p.m. Past Presidents/Life Members Luncheon
 Noon – 2:00 p.m. Chapter Presidents/Secretaries Luncheon
 1:45 p.m. – 2:45 p.m. Concurrent Sessions
 3:00 p.m. – 4:00 p.m. Concurrent Sessions
 4:15 p.m. – 5:15 p.m. Second General Business Session
 4:15 p.m. – 6:00 p.m. Second General Business Session
 6:00 p.m. – 6:30 p.m. Second VP Reception

Thursday, Aug. 17

7:00 a.m. – 1:00 p.m. Registration
 8:00 a.m. – Board of Officers Meeting
 8:00 a.m. – 9:00 a.m. Concurrent Sessions
 8:00 a.m. – 5:00 p.m. AFC Advisor Refresher Training
 8:30 a.m. – 4:00 p.m. Corporate Advisory Committee Meeting
 9:15 a.m. – 10:15 a.m. Concurrent Sessions
 10:30 a.m. – 11:30 a.m. Concurrent Sessions
 1:00 p.m. – 2:00 p.m. Concurrent Sessions
 2:15 p.m. – 3:15 p.m. Concurrent Sessions
 6:30 p.m. – 7:30 p.m. Closing Reception
 7:30 p.m. – 9:30 p.m. Closing Banquet/Awards

Friday, Aug. 18

7:00 a.m. – 4:00 p.m. 3rd Annual APCO Golf Tournament

Receive Weather Alerts Automatically

on your 2-way radio system,
PA system, voice-mail,
numeric pager or telephone!

- Rack-mount and mobile systems
- Warnings digitally recorded for DTMF access and playback
- Designed specially for demanding Public Safety use

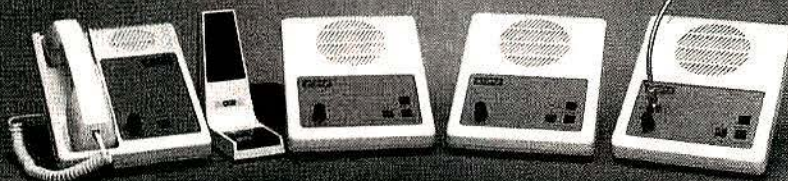
Call toll free 1-888-877-8022
or visit our Web site at:
<http://www.thuneagle.com>



U.S. Patents 5,444,433 - 5,574,999 - D,377,795

CIRCLE (53) ON FAST FACT CARD

Need Remotes?



Call us.



DC Remotes
DC Termination Panels
Tone Remotes
Tone Termination Panels
Local Extensions
Multi-Channel Remotes



941 Hensley Lane • Wylie, TX 75098
Voice (800) 869-9128 • Fax (888) 437-5360
www.epicom.com

CIRCLE (59) ON FAST FACT CARD

Intergovernmental planning creates public safety 'radio utility'

Spotsylvania County, VA, applies infrastructure planning to create an 800MHz radio system with long-term benefits.

By John Brown
and Frederick G. Griffin, P.E.

In 1995, the need was first identified for a new county radio system to serve Spotsylvania County, VA, and other interested entities. There was the "traditional" need within public safety (fire, law enforcement and EMS) and public services (inspectors, administrators and utilities). The broader view indicated a potential need from schools and neighboring jurisdictions as well. The future radio system could, in some sense, be viewed as a "radio utility in the sky," serving users on a prorated, cost-share basis. The decision was made to establish an 800 MHz trunked radio system because of available frequencies.

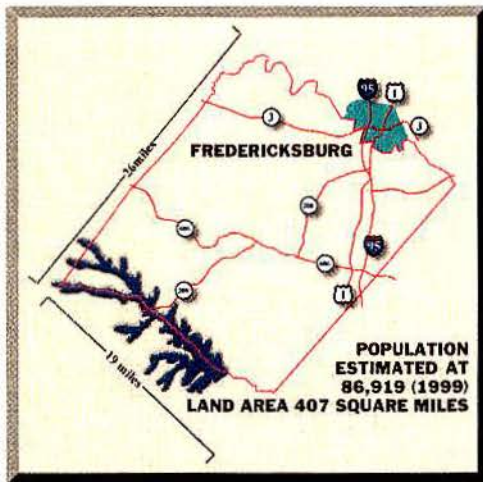


Figure 1. Spotsylvania County, VA.

The locale

Spotsylvania County, comprising 407 square miles in eastern Virginia, is midway along a 100-mile line between Washington and the Virginia state capitol at Richmond. About 65% of the county lies in Virginia's Piedmont physiographic province, and about 35% lies in the Coastal Plain. Elevations range from sea level to 540 feet.

Spotsylvania is a growing place, therefore it needed to plan ahead to continue to provide service to its residents. According to *Virginia Town and Country* magazine (April 1996), the county experienced a 98% growth rate from 1990 to 1994.

Intergovernmental liaison

In August 1996, the county hosted an informal workshop for all of the contiguous governmental bodies, namely the counties of Louisa, Stafford, King George, Caroline, Orange and the city of Fredericksburg, VA. The result was a pooling of the previously assigned National Public Safety Planning Advisory Committee's (NPSPAC) frequencies for Spotsylvania County and Fredericksburg. These would be added to the five channels already licensed to the county. Mutual-aid

interconnections would be established for the other counties.

Coverage requirements

The area design of a radio system can, in some cases, lead to confusion or unrealistic expectations. Because of the priority nature of hardware and early commitments to infrastructure suppliers,

mistakes are easily made in the planning process. To avoid this, Spotsylvania County created a user committee to define the vision and expectations of the system over the life cycle of the embedded investment. The committee also addressed the coverage requirements by agreeing on a future land use map to envision public safety needs for in-building portable radio use.

System architecture

As a result of the coordination meeting and the coverage requirements, a two-site, simulcast, trunked system was

specified. The design of any trunked radio system has to address system failure scenarios. In this case, two scenarios were thoroughly discussed:

► **Antenna failure or tower failure** — The user committee members agreed that in this unlikely event, they could operate countywide service from one site using mobiles. They would take whatever a single site would provide for portable coverage. Neither site alone will provide satisfactory portable radio, in-building coverage for the entire county.

► **Fiber failure** — The communications center, midway between the two sites, is connected to the microwave hub via a fiber-optic cable. Loss of this cable was the second failure scenario. A two-hop microwave system was required to connect the sites to the hub and then to the communications center. To guard against fiber-optic cable failure, all of the simulcast common equipment was placed in the microwave hub shelter. In the unlikely event of a fiber failure, countywide services would be maintained. The communications center would continue to provide dispatch services using control stations installed for that purpose. Figure 2 on page 61 depicts the system architecture.

Other communications needs

Spotsylvania County also lies within the Lake Anna Nuclear Power Generation Plant evacuation area. The evacuation plan calls for the use of the county school buses. This required a communications link with the school bus system. (In the Commonwealth of Virginia, school systems are independent from the county administration.) At the time of the system inception and design, the

Brown is system manager for Spotsylvania County, VA. Griffin, a member of MRT's editorial advisory board, is president of Frederick G. Griffin, P.C., Lynchburg, VA.

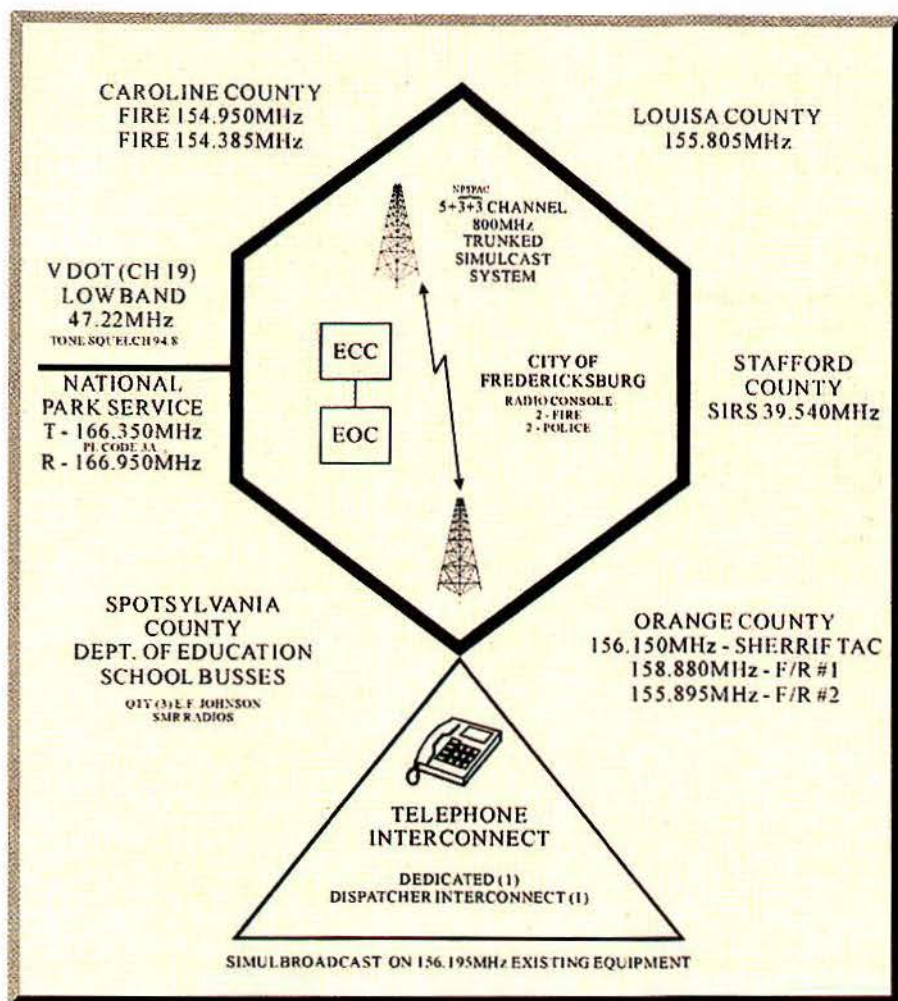


Figure 2. System architecture.

school system was using commercial SMR service for communications with school buses. As time has passed, SMR costs have escalated. This triggered the plan to migrate the school system's bus communications to the radio utility, thus providing another cost sharer.

RF channel usage

The pooled spectrum was assigned as shown in Table 1, below. By the system mapping, countywide mobile-only talk groups will first pick channel group 2 and overflow into the high-power channels of channel group 1. The control channels are restricted to use only channel group 1. For countywide public safety portable radio use, channel group 1 will be selected first. This would overflow to channel group 2. All use for Fredericksburg or the northern county service area will have channel group 3 as the first choice, overflowing

to group 1 and then to group 2.

Coverage criteria

This is a mixed-spectrum system. The total system uses both the old high-power spectrum and the NPSPAC spectrum. The old band is limited only by height/power regulations. The NPSPAC spectrum is controlled by a power limitation based on service area. The system was designed and specified for the portable coverage provided by the high-power channels. The NPSPAC channels were contracted for the equipment specifications. The lesser requirements for mobile coverage were preferred to the NPSPAC channels by the system map.

Adding a new user

As the system was being built, a regional jail was being built in Stafford County, to the north. The regional jail has two off-premise communications

1) DLC specializes in installation hardware, including terminals, screws, fuses and fuse holders, cable ties, battery terminals, relays and more to make your mobile radio install a breeze.

Yes, DLC

2) Speaker and earphone microphones for handheld transceivers give 2-way radios superb crystal clear audio

3) Noise filters for most mobile applications: L/C, electronic and torroid.

4) Muth Signal Mirror® Safety System are hot and available for a wide variety of vehicles including the Ford Crown Victoria

5) Battery isolators, low voltage disconnects and battery separators from your first source!

6) Order by phone on our 24 hour fax line.

7) We have an experienced sales staff ready to help you with your orders.



**is
your
First
Source**

**FOR ELECTRONIC PARTS
AND ACCESSORIES**

**DLC DAVID LEVY
COMPANY, INC.**

ELECTRONIC PARTS AND ACCESSORIES
12753 Moore Street • Cerritos, CA 90703 • U.S.A.

NATIONWIDE/CANADA (800) 421-3536
ORDER FAX (800) 421-3538
LOCAL (562) 404-9998
FAX (562) 404-9698
CUSTOMER SERVICE (800) 962-4120
E-MAIL dlcw@aol.com

Table 1. Spotsylvania County system pooled spectrum.			
NORTH SITE	SOUTH SITE	CHANNEL NO.	DESIGNATOR
5 Spotsylvania channels	5 Spotsylvania channels	220, 260, 300, 340, 380	Group 1
3 Spotsylvania channels	3 Spotsylvania channels	610, 646, 813	Group 2
3 Fredericksburg channels	—	689, 723, 759	Group 2

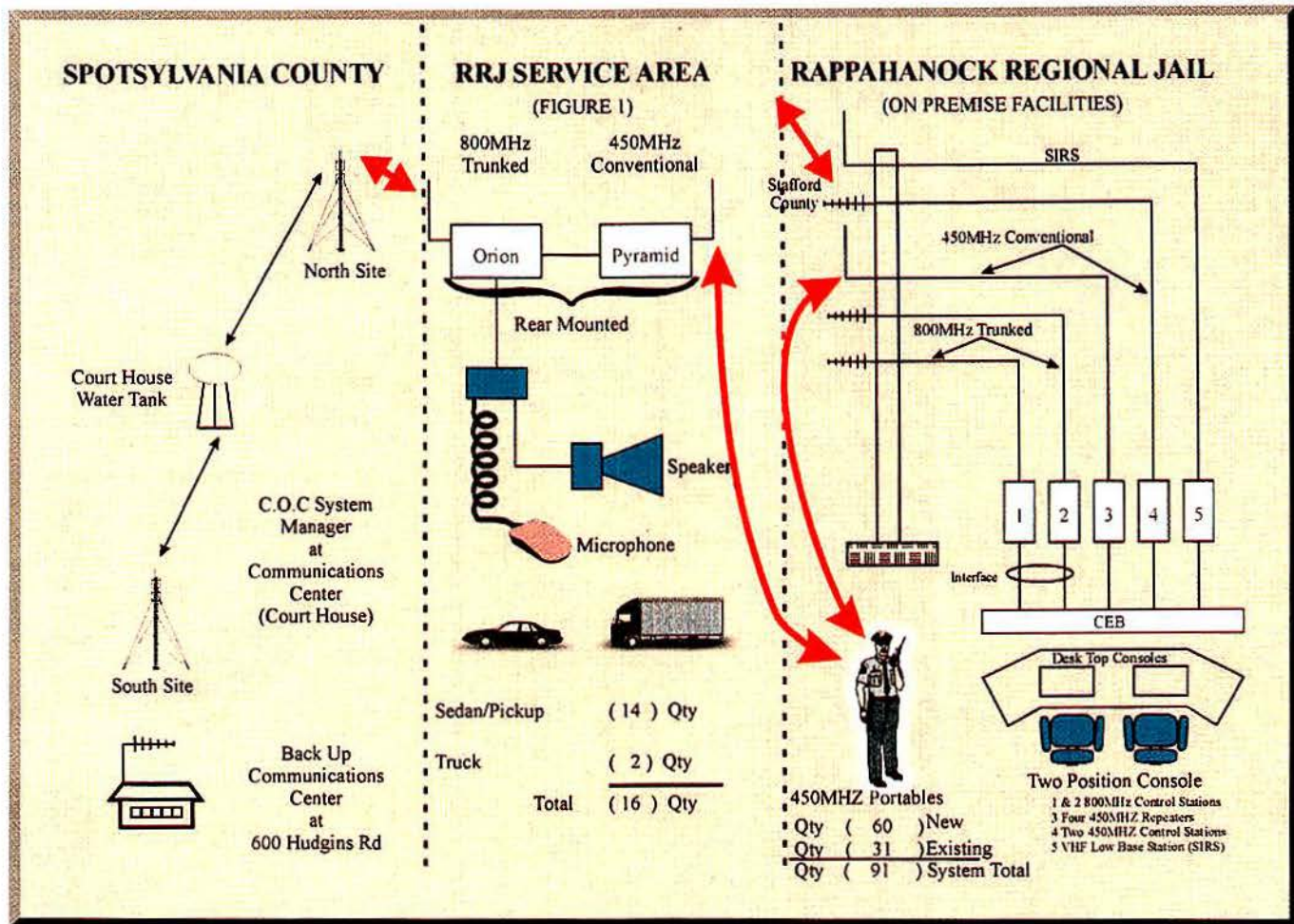


Figure 3. System configuration.

needs; work release and liaison. It was desired that on-premises officers use the 450MHz band because the Stafford County sheriff's department uses it. In case of jail disturbances, all officers wanted to be in the same band. Off-premise activity required communications into the counties of Stafford, King George, Spotsylvania and into Fredericksburg. A cost-value determination had to be made by the regional jail on how to cover such a large area for light, but critical, use. Because of the in-building coverage requirements of Spotsylvania County, there is an extended mobile coverage beyond the county boundaries. The result was to use the radio utility, which provided mobile coverage for its service areas. The regional jail benefitted from this mobile coverage and the use of crossband repeaters.

The system configuration is shown in Figure 3 above. Two trunked control stations were installed for reliability and for direct communications to the communications center, in case of a regional event.

Implementation cost savings

Most complex systems of this type are purchased on a turnkey basis. Us-

ing county employees for some of the work (if the county is willing to accept the responsibility), can save money. (Contractors pass through mark-up.) In this case, site work and grading was performed by the public works department. Shelters were accepted at the factory, then transported and installed by the county.

Site acquisition is always an independent cost. In this case, towers were constructed on county-owned property (two landfills). The benefit was threefold. First, there was minimum visual clutter. Second, costs were lower. Third, the towers were oversized to accept additional tenants for a future revenue stream. The county has elected to construct its own tenant shelters, therefore becoming the site manager and thus developing an enterprise activity.

Benefits to all

This system is a benchmark of intergovernmental cooperative planning and resource use among several different entities. The administration and elected officials of Spotsylvania County have taken the long view to benefit all.

2 to 4 Lines + Data

digiNX, digital wireless solutions

Simultaneous Voice & Data

- 400-520 / 790-960 MHz
- 64 / 128 / 256 & 512 KBPS
- Programmable Interfaces
- Full-Duplex

TELEPOINT INC.
1022 S. La Cienega Blvd. • Los Angeles, CA 90035
Phone: +1 310-652-3666 • Fax: +1 310-652-0777
info@telepointinc.com • www.telepointinc.com

CIRCLE (48) ON FAST FACT CARD

AMTA works with SiteSafe to coordinate ATA frequency

The American Mobile Telecommunications Association (AMTA) is trying its hand at frequency coordination, in addition to getting involved in the upcoming 700MHz guard band auction by offering services through a Web site. Whether AMTA will attempt to become a guard band manager remains to be seen, however.

AMTA is assuming frequency coordination responsibilities for the American Trucking Association (ATA). AMTA has also entered into an agreement with SiteSafe, Arlington, VA, and its subsidiary Biby Engineering Services to provide this coordination and other engineering services.

The agreement between ATA and AMTA will shift coordination responsibilities on an interim basis. The two associations plan to file with the FCC for permanent transfer of ATA's certification as a frequency advisory committee.

AMTA and SiteSafe will also offer a variety of engineering services through a Web site, guardbandmanager.com. These services, along with FCC rules and auction procedures, will be posted on the site to assist participants in the FCC's 700MHz guard band auction, which will be held Sept. 6, 2000. The site will also feature information on other system development services available through SiteSafe.

"SiteSafe is delighted to be associated with AMTA. The online frequency coordination service from our partnership with AMTA will be equal to or superior to that of other coordination services," said Wesley McGee, president of SiteSafe.



McGee

The new services will provide coordination processing and information to clients to help make business decisions. Analyses of FCC license applications as well as electronic filing through AMTA's Web site will also be offered.

Nextel Communications faces possible racial, sexual discrimination suits

(WirelessClick) — As of June 20, more than 300 current and former Nextel Communications employees were accusing Nextel of racial and sexual discrimination and planned to file 25 lawsuits against the company with the Equal Employment and Opportunity Commission, *The New York Times* reported.

Citing lawyers representing the employees, the *Times* said 25 lawsuits would be filed against Nextel on behalf of workers in Colorado, Illinois, New Jersey, Ohio and Tennessee. The lawyers also planned on filing an additional 302 complaints from workers in other states at a rate of 50 per week until all have entered the courts, according to the *Times*. The allegations were raised by about 2% of Nextel's 15,000-person workforce.

The lawyers from Leeds, Morelli & Brown said they planned to seek millions of dollars in damages from Nextel, topping Texaco's \$176 million racial bias settlement in 1996, according to Reuters.

In a copy of one of the complaints released to Reuters, a Hispanic male employee alleged his white supervisors called him "gang banger," "spic" and "thug." The employee contended he went on disability for several weeks due to emotional trauma and depression after less-experienced white coworkers received promotions or transfers.

Nextel issued a statement on June 20, saying that the company could not comment on allegations until the complaints were filed before the EEOC.

"Nextel cannot comment on any

specific allegations until all the relevant facts are gathered and assessed, and although we have repeatedly requested the law firm of Leeds, Morelli & Brown to provide us with information regarding these claims, we are awaiting receipt of the complaints ..., the statement read. "We will conduct a thorough investigation of those allegations once we have received the information we need to do so."

The statement further said that Nextel had repeatedly tried to cooperate with the lawyers on the case, but Leeds,

Morelli & Brown had demanded Nextel pay "outrageous" legal fees while refusing to disclose any information about the complaints.

The lawyers told the *Times* that they intended to seek the EEOC's permission to file suit against the company under Title VII of the Civil Rights Act of 1964 and also plan on seeking class-action status for their clients. The lawyers added that they planned to ask the court to require Nextel to adopt sensitivity training and diversity programs.

—Kevin Fitchard

Nothing Beats A...

Quality Means Reliability ...

In today's marketplace, Diversified Electronics, Inc. stands out as the Quality Leader you can always depend on.

Call us for:

- ✓ Motorola Original Radios, Parts & Accessories,
- ✓ Motorola Mag One Line of Products,
- ✓ David Clark Headsets

When you have lives on the line you can't afford to take chances.

Buy the best and pay less from Diversified.

Visit Us On The Web At www.diversifiedelectronics.com



DIVERSIFIED ELECTRONICS, INC.

309-C Agnew Dr.

Forest Park, Georgia 30297

Toll Free: 1-800-646-7278 Ext. 144 Fax: (404) 361-6327 Ext. 144



A.C. Simmonds & Sons sold to DCS Electronics

Plans by Simmonds Capital Ltd. (SCL) to sell its A.C. Simmonds & Sons manufacturer's stocking representative division to senior managers of its SCL Electronics subsidiary, employees of the division and other investors, have fallen through. Instead, SCL is selling its division in two parts and has accepted an offer for the division's industrial electronics components distribution business.

The buyer, DCS Electronics, will acquire the A.C. Simmonds & Sons trade

name, assume outstanding sales contract responsibilities and purchase any of the division's remaining industrial product inventory on a consignment basis. DCS Electronics expects to retain the division's most experienced employees. The purchase price will be paid by a five-year secured promissory note and cash as the inventory is sold.

DCS Electronics Ltd. is a manufacturers' representative in Ajax, Ontario (Toronto) with offices in Vancouver, Edmonton, Ottawa, Montreal and

Halifax. DCS Electronics is owned by David C. Simmonds and his son, Paul T. Simmonds. David Simmonds is the grandson of A.C. Simmonds and the son of L. Claude Simmonds. He was president of A. C. Simmonds & Sons Ltd. until 1994 when he began DCS Electronics. DCS Electronics represents several lines formerly represented by A. C. Simmonds & Sons Ltd., including Mallory and Guardian. Together, A. C. Simmonds & Sons Ltd. and DCS Electronics have represented these manufacturers for 70 years.

Referring to the earlier planned sale of the entire division, David's brother, John Simmonds, SCL's chief executive, said, "As we progressed, it became apparent that the employee buyout offer was not going to be able to be properly financed."

The difficulty led to the decision to sell parts of the business separately. John Simmonds said that discussions are continuing with several potential purchasers of Evolution Audio as a distinct business unit. It is the last of SCL's operating businesses.

SCL is selling its operations to repay bank debt and to focus on investments and merchant banking. SCL's investments include interactive gaming technology focused on the North American horse racing market, Internet service sites focused on home products and home service, and wireless communications. The company has its headquarters in Willowdale, Ontario (Toronto).—DB

got



?

Our **LT-4200** brings you more value and features than any other LTR panel in the business... Like its front panel status LCD, front and rear RS-232 ports, immense user programmability and UHF overlay capability.

Its no wonder that many system operators have purchased 50 or more for their UHF to LTR conversions.

Call Ray Dashner today (or visit our website) for the complete story.



Connect Systems Inc.

2259 Portola Rd.
Ventura, CA. 93003

Toll Free **(800) 545-1349**

Phone (805) 642-7184

FAX (805) 642-7271

Email sales@connectsystems.com

Internet www.connectsystems.com

NSA marks 60th in KC

KANSAS CITY, MO — An exhibition of the latest technologies to support law enforcement and a broad-based seminar program highlighted the National Sheriffs' Association (NSA) 60th annual conference here, June 17-21.

Seminar topics that touched on communications issues included federal revenue funding, alarm administration and radio interoperability in cases such as the Columbine incident in Colorado.

Radio industry and ancillary products exhibitors included E. F. Johnson, Motorola, Racal, Vision Software, Global Dispatch Technology, Itronix, Cerulean, Fibrebond, Positron, and TeleStatus.

Sheriff Thomas N. Faust of Arlington County, VA, became the new executive director of NSA on July 17. Faust brings to NSA over 23 years of criminal justice and law enforcement experience. He is a past president of the American Jail Association. —D.K.

CSI is a registered trademark of Connect Systems Inc. LTR is a registered trademark of EF Johnson Co.

CIRCLE (50) ON FAST FACT CARD

News Notes

Plant Equipment (PEI), Salt Lake City, has signed agreements with **Cerulean Technology** and **Motorola** to expand its E9-1-1 capabilities. Cerulean has agreed to market and re-sell PEI's Orion mapping applications while working with PEI to integrate Cerulean's Packetcluster with PEI's E9-1-1 applications. According to Cerulean's vice president of marketing, **David Rosi**, "With this agreement, public safety agencies can expedite the purchase and implementation of fully integrated mapping and mobile applications, resulting in more efficient and responsive emergency personnel."

PEI's agreement with Motorola will allow for the integration of PEI's call handling and report writing software into Motorola's Centracom Elite dispatch center. "As the market moves toward a more integrated product model, this solution will provide a seamless integration of telephone, radio and other equipment," **Tim Fuller**, president of PEI, said.

HTE, Lake Mary, FL, has agreed to provide the Royal Bahamas Police Force with its CAD400 dispatch, E9-1-1 police interface and Pager Connect applications, among others. "HTE's highly integrated applications and state-of-the-art technology will help the Royal Bahamas Police Force effectively combat crime, while improving efficiency throughout the agency," **Brian Heafy**, HTE's vice president of public safety and justice, said.

And "down under," **Zetron**, Redmond, WA, has acquired the ACOM Business Unit from **Plessey Asia Pacific**. The new acquisition will be run in Brisbane, Australia, under its new name, **Zetron Australasia**, as a wholly owned subsidiary of Zetron.

You may not trust your Congressman, but now he can trust his power company. **Dataradio**, Atlanta, has been awarded a contract for an eight-site, 900MHz mobile data network for Potomac Electric Power Company (PEPCO), which serves, among others, the District of Columbia.

We've heard of bootlegging movies, but radios? **Motorola**, Schaumburg, IL, has settled its civil lawsuit for copyright and trademark infringement against International Cellular Telephone in Federal Court in Miami. "These radios were not meant for the U.S. market, and any consumer who purchased one would not be getting what he or she expected," **Wayne Grimm**, Motorola vice president of distribution, said.

The APCO Institute, in conjunction with Jackson State University, is developing the first online degree program for public safety communications. Starting in September 2000, the program will give those in the profession the opportunity to earn an associate's degree via the World Wide Web. Bachelor's and master's degree programs will follow. No word yet on plans for the development of online dorm life.

Com-Net Ericsson wins Florida radio project

Com-Net Ericsson Critical Radio Systems, Lynchburg, VA, has been busy in June, creating a major alliance, acquiring a data systems company and winning a major state contract.

The state of Florida Joint Task Force has awarded the Florida Satewide Radio Communications Project to Com-Net Ericsson, creating a public-private partnership for critical communications. The system, to be owned and operated by the company, will provide communications for state agencies.

Com-Net had also acquired TransTech System, Miami, as of June 16. TransTech serves as a data systems consultant and integrator of public safety, utility and public transit. TransTech will be assimilated into Com-Net Ericsson's new data systems function.

Com-Net formed a strategic alliance with Orbacom Systems at the beginning of June to market Orbacom's TDM series consoles and to provide a Provoice and EDACS interface to existing TDM customers.

Guaranteed Waterproof!

One Right Connection!

SureFlex
Cable Assemblies
featuring Right Angle Connectors

- Best electrical performance - equivalent to straight connectors
- Lowest return loss
- Best weatherproofing - guaranteed to IP68

Demand The Best

1-800-255-1479 • www.andrew.com

Relm Wireless seeks payment, wins order, withdraws Midland offer

Part of Relm Wireless' conversion from what Richard K. Laird, the company's president, has described as "mini-conglomerate" into a focused radio communications equipment manufacturing, sales and distribution company hit a snag on June 16 when the current owner of one of Relm's former businesses defaulted on a principal payment.

The former Relm subsidiary, a paper manufacturing business, did not pay the scheduled \$400,000 of a \$1.6 million outstanding principal balance on a note. Relm has accelerated the note and has

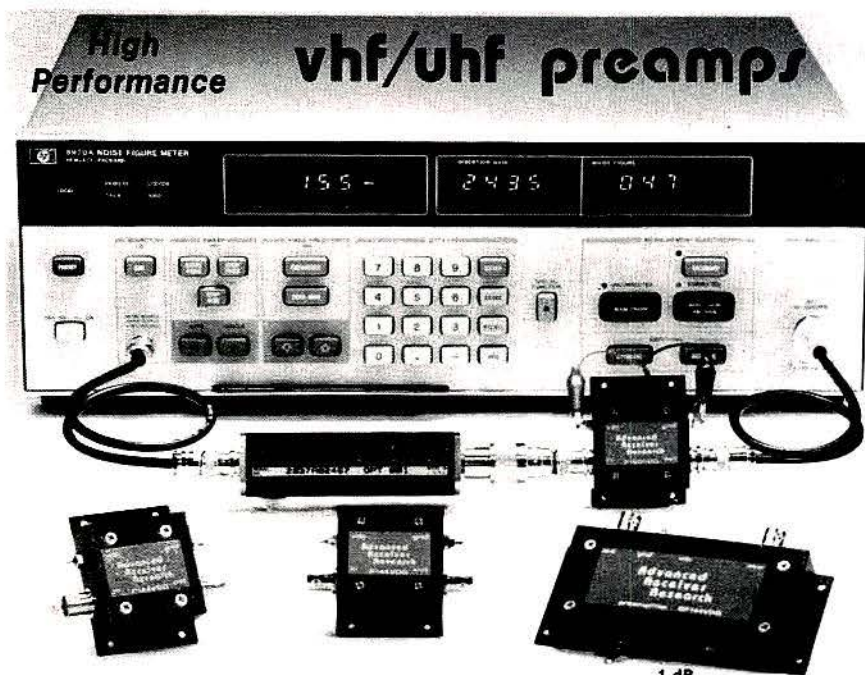
demanding the full balance. Although the default will adversely affect Relm's cash flow, a statement from the company said that it can fund working capital requirements from operations and a revolving line of credit.

A month earlier, Relm had announced that it received a \$1.9 million order under an existing contract from the US Army. Deliveries are scheduled to begin in the fourth quarter of 2000 and continue through the first quarter of 2001.

Early in the year, Relm acquired sales

and distribution rights to the Uniden private radio products and contracted Uniden America to continue their manufacture. At about the same time, the company announced plans to purchase inventory, tooling and intellectual property rights for FM two-way radio products owned by the Midland International subsidiary of Simmonds Capital Ltd. (SCL), Willowdale, Ontario, Canada, and housed at Hitachi Denshi facilities in Japan. In late June, Relm withdrew its offer, stating that the company needed to focus on building its core land mobile radio wireless business before considering any additional acquisitions.

SCL Chairman John Simmonds said, "As a significant shareholder of Relm, we understand their management's immediate focus on achieving profitability through stabilizing their current wireless business. At SCL, we have already identified alternate opportunities to deploy our wireless assets and the Midland International intellectual property." —DB



Receive only	Freq. Ranges (MHz)	N.F. (dB)	Gain (dB)	Comp. (dBm)	Device Type	Price
P30VD, P35VD, P40VD, P45VD	30-35, 35-40, 40-45, 45-50	<1.3	15	0	DGFET	\$ 44.95
P30VDG, P35VDG, P40VDG, P45VDG	30-35, 35-40, 40-45, 45-50	<0.5	26	+12	GaAsFET	\$109.95
P150VD, P160VD, P170VD	150-160, 160-170, 170-180	<1.5	15	0	DGFET	\$ 44.95
P150VDA, P160VDA, P170VDA	150-160, 160-170, 170-180	<1.1	15	0	DGFET	\$ 56.95
P150VDG, P160VDG, P170VDG	150-160, 160-170, 170-180	<0.5	24	+12	GaAsFET	\$109.95
P450VD, P460VD	450-460, 460-470	<1.8	15	-20	Bipolar	\$ 49.95
P450VDA, P460VDA	450-460, 460-470	<1.2	16	-20	Bipolar	\$ 74.95
P450VDG, P460VDG	450-460, 460-470	<0.5	16	+12	GaAsFET	\$109.95
P800VDG, P830VDG, P860VDG	800-830, 830-860, 860-890	<0.6	19	+12	GaAsFET	\$119.95
Inline (rf switched)						
SP30VD, SP35VD, SP40VD, SP45VD	30-35, 35-40, 40-45, 45-50	<1.4	15	0	DGFET	\$ 74.95
SP30VDG, SP35VDG, SP40VDG, SP45VDG	30-35, 35-40, 40-45, 45-50	<0.55	26	+12	GaAsFET	\$139.95
SP150VD, SP160VD, SP170VD	150-160, 160-170, 170-180	<1.6	15	0	DGFET	\$ 74.95
SP150VDA, SP160VDA, SP170VDA	150-160, 160-170, 170-180	<1.2	15	0	DGFET	\$ 86.95
SP150VDG, SP160VDG, SP170VDG	150-160, 160-170, 170-180	<0.55	24	+12	GaAsFET	\$139.95
SP450VD, SP460VD	450-460, 460-470	<1.9	15	-20	Bipolar	\$ 79.95
SP450VDA, SP460VDA	450-460, 460-470	<1.3	16	-20	Bipolar	\$104.95
SP450VDG, SP460VDG	450-460, 460-470	<0.55	16	+12	GaAsFET	\$139.95

Every preamplifier is precision aligned on ARR's Hewlett Packard HP8970A/HP346A state-of-the-art noise figure meter. RX only preamplifiers are for receive applications only. Inline preamplifiers are rf switched (for use with transceivers) and handle 25 watts transmitter power. Mount inline preamplifiers between transceiver and power amplifier for high power applications. System S/N improvement 6-14 dB typical. Other amateur, commercial and special preamplifiers available in the 1-1000 MHz range. Please include \$2 shipping in U.S. and Canada. C.O.D. orders add \$2. Air mail to foreign countries add 10%. Order your ARR RX only or inline preamplifier today and start hearing like never before!

**Advanced
Receiver
Research**

Box 1242 • Burlington, CT 06013 • 860-485-0310



CIRCLE (52) ON FAST FACT CARD

FCC Notes

Lower-power plan accepted

In a Public Notice issued June 29, the FCC accepted the Land Mobile Communication Council's modified low-power consensus plan. Accordingly, the FCC will license only low-power operations on specified 12.5kHz offset frequencies in the 450MHz-470MHz band. Each frequency coordinator must maintain a current listing of frequencies designated for low power and make it available to the public upon request.

Fourteen channels have been designated as low-power for the public safety pool and 90 channels have been designated as low-power for the industrial/business pool.

New regulatory postings

John Borkowski has been named an assistant division chief for the Public Safety and Private Wireless Division of the Wireless Telecommunications Bureau. Borkowski has served as chief of the policy and rules branch of the division since 1997.

William D. Lane has been named chief technologist of the Wireless Telecommunications Bureau. Lane is former chief scientist with Femme Comp. Prior to that position, he was responsible for the Joint Tactical Radio System Program of the U.S. Army. Lane was a colonel with the Army Signal Corps and was deputy head of the Department of Electrical Engineering and Computer Science at the U.S. Military Academy. He is a senior member of the Institute for Electrical and Electronics Engineers (IEEE). —D.K.

Mobile radios

Mobile radios serve professional industry

The CDM Professional Radio series of mobiles from Motorola is designed for the transportation, utility and construction industries. This series is the mobile companion to the HT series of professional radios. The radios feature talk-group capability to allow communications exclusively with designated groups of workers and discreet emergency signaling. They also incorporate features associated with cellular and landline telephones, such as caller ID, paging and text-message exchange. The CDM1550-LS operates on any UHF LTR trunking system, which gives users a wide calling area, fast channel access and privacy. Accessories such as visor-mounted microphones provide hands-free operation for users who cannot easily reach their radios, while speakers increase volume for noisy environments.

CIRCLE (351) ON FAST FACT CARD



Mobile radio features compact design

Kenwood Communications' TK-6110 is a 70W, 32-channel VHF lowband mobile radio. The compact design complements the Kenwood public-service TK-190 portable and TK-690 mobiles. The radio features priority scan, eight-character alphanumeric LCD, programmable front-panel keys, internal speaker, mechanical volume knob, flash ROM memory, PC programming and PC tuning. Designed by and for fire departments, utilities and transportation agencies,

the radio meets MIL-STD 810C, D & E specifications. The integrated heat-sink/die-cast chassis affords a compact, low-profile design. QT/DQT CTCSS tone/digital coded squelch, two-tone/DTMF decode and operator-selectable tone are standard.

CIRCLE (352) ON FAST FACT CARD



Mobile radios offer 40W output power

The Panther 300M mobile radio from Com-Net Ericsson Critical Radio Systems provides conventional communications. The radio features a 40W power output and an optional external speaker that produces 10W of audio for noisy environments. The Panther series offers the ability to transfer personalities radio-to-radio using Copycat technology. End-users will not need to return their radios to the shop for "personality" changes. The radios can be programmed with a set of functions that can be transferred to other radios. The radio operates on FCC refarmed frequencies and meets MIL-STD 810E for drop, shock and vibration.

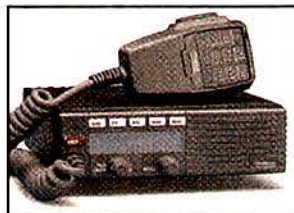
CIRCLE (353) ON FAST FACT CARD

Radio complies with Project 25 standard

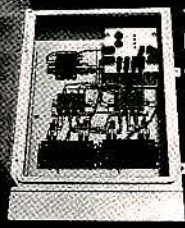
King Communications' KMR-25 series includes a Project 25-compatible digital radio. Radios operate at VHF and UHF frequency ranges including 136MHz-174MHz, 403MHz-470MHz, 450MHz-512MHz and 806MHz-870MHz. The radios can also operate on conventional Smartnet and Smartzone systems. They

feature 256 channels, and the dimensions are 2.1" x 7.15" x 8.3". The voice digital mode includes voice coding of IMBE 4.4kbps and a frame resynch interval of 180msec. Accessories include a 12W external speaker, remote-mount conversion kit, spare control head kit and DTMF microphone.

CIRCLE (354) ON FAST FACT CARD



Mobile, Cellular and SMR



Tower Mounted Amplifier

fiplex

COMMUNICATIONS INC.
7331 NW 54th Street - Miami FL 33166 - USA - Ph (305) 884-8991 - Fax (305) 884-4041
E-mail: fiplex@bellsouth.net / Web site: www.fiplex.com



Mobile Duplexer



Cellular Duplexer

CIRCLE (65) ON FAST FACT CARD

READERS' CHOICE

Of the new products in the January 2000 issue, this one generated the biggest reader response. For more information on this product, circle the corresponding Fast Fact number on the card found in the back of this issue, and mail the card to us.

Headset integrates UHF radio, transmitter

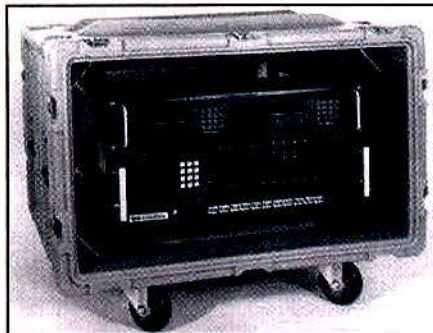
The TC917 from CeoTronics is a UHF radio transmitter and receiver integrated into one headset. The headset can be operated on one frequency or on two frequencies with 10-channel capability between 433MHz and 470MHz. It can also be programmed for users' existing frequencies and systems. The transmitter is activated by a push-to-talk button or by vox for hands-free communication. Different versions are available,



including additional ASR (ambient sound reception), with a helmet attachment, as a one-way communications system with one transmitter and several receivers, as a lightweight headset with external transceiver unit or in connection with interfaces to cable-bound intercom systems. An intrinsically safe version for use in areas with explosion hazard is available.

CIRCLE (500) ON FAST FACT CARD

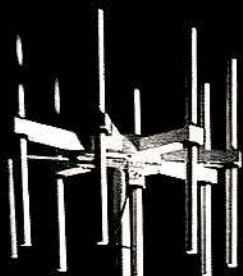
Interconnect provides cross-band operation



The TRP-1000 transportable radio interconnect system from JPS Communications provides communications interoperability among HF, VHF low-band and highband, UHF, 800MHz, trunking talk groups and encrypted networks. The system is packaged in one or more transportable cases that are designed to withstand extreme weather, and it includes multiple radios prewired to JPS Communications' ACU-1000 intelligent interconnect unit.

CIRCLE (401) ON FAST FACT CARD

TRANSMITTER LOCATION

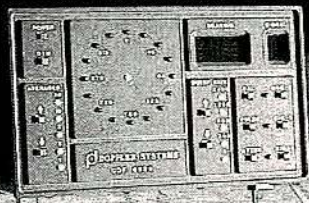


New fixed site direction finders provide 2 degree accuracy, and include software for triangulation from a central control site. Mobile versions also available covering 50MHz to 1 GHz

Doppler Systems Inc.

PO Box 2780 Carefree, AZ 85377
Tel: (480) 488-9755 Fax: (480) 488-1295
www.dopsys.com

European Marketing Director Denis Egan
PO Box 2, Seaton, Devon EX12 2YS England
Tel & Fax: 44 1297 62 56 90



CIRCLE (54) ON FAST FACT CARD

Voice Recorders...

document telephone conversations, meetings & two-way radio messages, provide supervisory monitoring, etc.

Since 1975 Omnicron Professional Voice Logging Recorders have provided an affordable and easy to use solution for both archival voice storage and instant review of conversations.



Seven standard off-the-shelf models plus custom units to meet unique requirements ★ Voice activated recording ★ 2, 8, or 16 hours of talk time on a standard audio-cassette ★ Time and date channel ★ Alarms prevent operator errors ★ Conference recorders for quality recording of large meetings ★ Full line of accessories
Over 1000 dealers worldwide ★ Dealer inquiries welcome



OMNICRON ELECTRONICS

581 Liberty Highway
Putnam, CT 06260
860-928-0377
FAX: 860-928-6477

www.omnicronelectronics.com

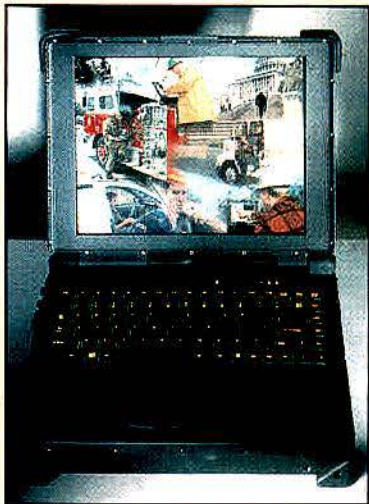
CIRCLE (55) ON FAST FACT CARD

Batteries support XTS-3000 radios

Multiplier's new line of rechargeable replacement batteries are designed for the Motorola XTS-3000 radio. Models M8294, M8923, M8923H and M8923HX are each rated at 7.5V. The M8294 is a NiCd battery with 1,700mAh capacity. The M8923, M8923H and M8923HX are NiMH batteries with 2,100mAh, 2,700mAh and 4,000mAh capacities, respectively. Multiplier's Sure-grip surface is available on each model.

CIRCLE (402) ON FAST FACT CARD

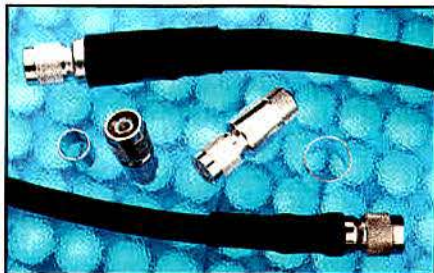
Laptop computer offers Pentium III



The Rocky II from Amrel is a ruggedized notebook computer certified under MIL-STD 810E, MIL-STD 461C and IP54 standards and offers a Pentium III 500MHz-650MHz processor. The processor allows for real-time MPEG-2 video encoding and editing. The computer's open architecture allows for future upgrades. The system is equipped with 256MB of memory and a 10G hard drive.

CIRCLE (403) ON FAST FACT CARD

TNC Connectors match low-loss coaxial cables

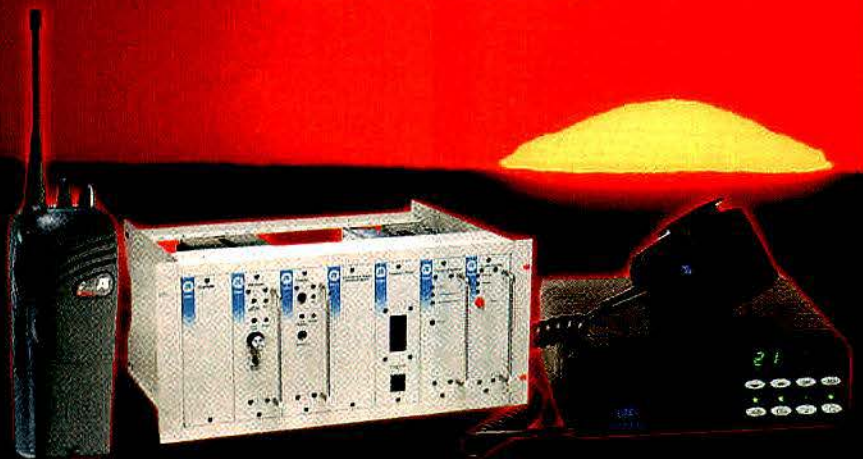


The EZ-400-TM and EZ-600-TM non-solder TNC male connectors from

Times Microwave Systems are designed for the company's LMR-400 and LMR-600 flexible, low-loss, coaxial cables. The connectors have knurled coupling nuts and crimp-style outer-contact attachment rings and are designed to operate at frequencies as high as 6GHz. Solderless EZ connectors are also available for most LMR cable sizes covering type N, 7/16 DIN and reversible-polarity TNC interfaces.

CIRCLE (404) ON FAST FACT CARD

HUTTON STOCKS TAIT!



Sounds Louder. Goes Further. Lasts Longer.

- Portable Radios - Tait Orca Series integrates impressive performance with rugged construction
- Repeater - T800 series II offers high performance, inherent reliability, and rugged construction
- Mobile Radios - T2000 series II is a high performance range of mobile radios with data capabilities
- Full Range of Accessories
- Conventional, LTR[®], MPT 1327



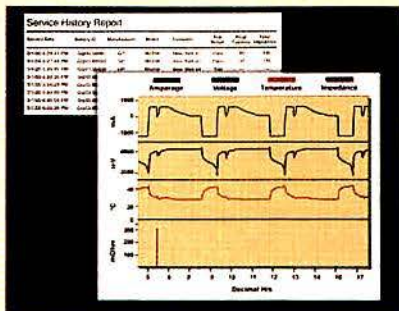
(877) 648-8866

www.huttoncom.com



CIRCLE (56) ON FAST FACT CARD

Maintenance program tracks battery life



Batteryshop 3.0 from Cadex Electronics is a battery management and maintenance program that

runs on Windows 95, 98 and NT and works with the Cadex C7000 battery analyzer. The program's service options include impedance measurement, priming and reconditioning. Point-and-click technology allows selection of specific models from a database of as many as 2,000 batteries. The analyzer can then be configured to the correct service parameters. Custom programs allow simulated load, self-discharge and full life-cycle testing.

CIRCLE (405) ON FAST FACT CARD

Controller eliminates bottleneck delays



The Life Line 100 9-1-1 controller from Positron sports a non-blocking design that ensures all calls can be processed simultaneously. The Life Line 100 offers distributed microprocessor architecture that allows each module to operate under its own control. Built-in, redundant, hot standby modules ensure uninterrupted service, and a modular design allows growth to 104 trunks and 144 positions with interfaces to tandem or direct trunks. Manual ALI request gives call-takers access to ALI information based on manual input of telephone numbers. The controller offers multiple, single-button, voice and data transfers and is configurable for both standard CAMA and enhanced MF trunk signals.

CIRCLE (406) ON FAST FACT CARD

YOU CHALLENGED US.

WE DELIVERED. MAXRAD LOW PROFILE.

TESTS SHOW MLPV800 PROVIDES UNMATCHED BANDWIDTH PERFORMANCE.

MAXRAD

Dear RF Expert:

We have some extremely exciting news that will make your job of selecting an antenna partner an easy one. We knew we had a great product; now independent tests by a leading technical university have shown our MLPV800 Low Profile antenna to provide unmatched broadband performance. We guarantee that you will be absolutely satisfied with our product, or we will refund your money.

We have developed a line of MLPV wideband antennas with models that cover UHF, PCS and 2.4 GHz ISM frequencies. We also offer dual-band models. You can select from a variety of mounting options, including a 3/4" hole mount and a permanent vandal-proof mount. All our MLPV antennas are available in black or white.

We are proud to have earned your business and look forward to serving you in the future.

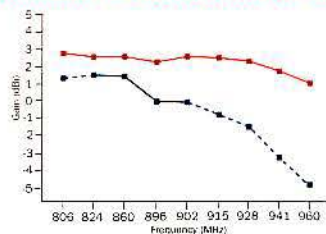
Sincerely,

Steven Deppe
Steven Deppe, CEO

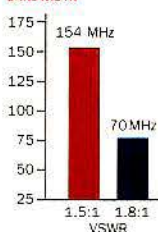
P.S. Feel free to contact us to request an MLPV sample at no charge.

The comparison test results from a leading technical university are clear: MLPV800 provides unmatched industry gain flatness versus frequency over the entire 800 and 900 MHz bands

GAIN COMPARISON OF MLPV800 VS. OUR PRIMARY COMPETITOR*



BANDWIDTH*



MLPV800 ANTENNA SPECS:

- Antenna height: 2.32" H
- Maximum power: 150 watts
- Nominal Impedance: 50 ohms
- VSWR: < 1.5:1

* Measured on a 12-inch square ground plane
* Based on manufacturer's published specs
** MLPV800 is a wideband antenna. The dotted line for our primary competitor's curve shows the performance of their antenna outside its specified frequency range. Our primary competitor requires different antenna models to cover all 800 and 900 MHz frequencies.

OTHER IMPRESSIVE FEATURES:

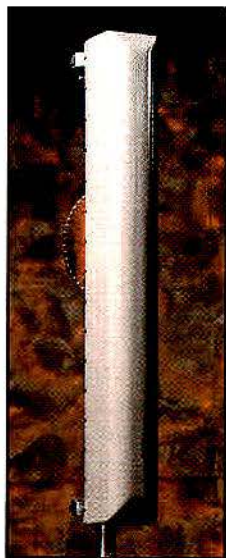
- Efficient radiator design made of solid brass. No lossy circuit boards utilized.
- 3/4" hole mount for easy installation. Permanent vandal-proof mount also available.
- UHF, PCS and 2.4 GHz ISM wideband models available.
- Dual-band models available.
- All models also available in white.



MAXRAD
STATE OF THE ART ANTENNAS
CALL (800)323-9122
www.maxrad.com

Antennas offer 40dB front-to-back ratios

Decibel Products extends its db Director series with the db Maxfill and db Maxgain antennas. The series offers 40dB front-to-back ratio and several choices of electrical downtilt and variable downtilt models. Standard pipe-mount or optional wall-mount, azimuth-adjustment and downtilt brackets are available. When used together, these optional mounting brackets allow simultaneous tilt and swivel. The antennas do not have rivets, screw connections or sliding metal-to-metal contacts in the main current path, which eliminates potential IM sources.



CIRCLE (58) ON FAST FACT CARD

CIRCLE (407) ON FAST FACT CARD

Connectors meet 15.203 regulations



Reverse-polarity connectors and adapters from **RF Connectors** meet FCC Part 15.203 regulations for non-standard coaxial connector interface for application compliance. Reverse-polarity products offered include RF-1005-C, N male crimp for RG-58/U; RP-1106-C, BNC male crimp for RG-58/U; and RP-3000-1C, SMA male crimp for RG-58/U.

CIRCLE (408) ON FAST FACT CARD

Recorder uses LAN, WAN, and PSTN

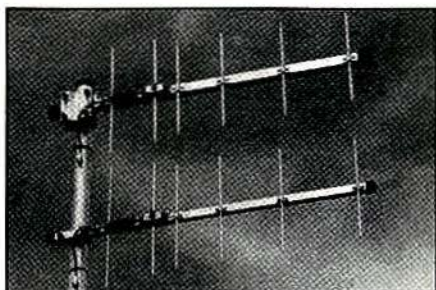


Racal Recorders' Wordnet series 2 digital communications recorder uses LAN, WAN and PSTN networks to deliver remote replay, management and alarms based on industry-standard SNMP. The recorder offers on-line storage capacity of 20,000 hours of DAT built into the unit. Wordnet includes incident number tagging for recordings and can be provided with an E9-1-1 ANI/ALI tagging system and full remote access to expedite responses to emergencies. The recorder offers a desktop console facility that allows dispatchers instant access to the last message received at the touch of a button.

CIRCLE (409) ON FAST FACT CARD

Heavy-duty yagi antennas endure radial ice

Astron Antenna's new line of rugged yagi antennas are derived from the company's commercial grade designs and feature a 1" square, heavy-walled tube for added durability in harsh environments, 1/4" aluminum rod elements that will stand up to radial ice, and Eversealed feeds to maintain peak performance. The antennas have a VHF range of 138MHz-250MHz and a trunking and cellular range of 806MHz-896MHz. They range from two-element antennas with 4dBd of



gain to 15-element yagis with more than 13dBd of gain.

CIRCLE (410) ON FAST FACT CARD

The Best Value in Two-Way Radio

The new PRYME MicroConnect™ line of two-way radios has something for everyone. These are powerful portables (5-Watts VHF or 4-Watts for UHF) that are truly palm-sized, measuring just 4.25" tall (excluding antenna)!

The radios feature brass reinforced knobs and a metal chassis for durability, and the back-lit LCD display helps the user keep track of the radio's status, even at night. The MicroConnect™ line of portables offers an impressive combination of power and capabilities.

Two versions of the MicroConnect are available, one for "dot" channel job site use and the other other for professional LMR applications

JobConnect Transceivers

8 Channel "dot" radios for job site use.

Available in VHF or UHF models.

ProConnect Transceivers

99 Channels for professional users

Available in VHF, UHF, and VHF Low Band Models

- * Just 4.25 inches tall! (excluding antenna)
- * 5 Watts Output Power (4 Watts for UHF models)
- * Includes CTCSS (38 tones)
- * Available for VHF (138-174 MHz) and UHF (440-470 MHz)! VHF Low Band (38-50 MHz) Coming in May of 2000!
- * Scan, Priority Scan, and Dual Watch
- * Optional 16 digit keypad and DTMF paging are available



Two-Way Dealers WANTED! Call 1-800-666-2654!

PRYME
Radio Products

by **PREMIER Communications Corp.**

480 Apollo St. #E Brea, CA 92821

Phone: 714-257-0300 Fax: 714-257-0600

Web: <http://www.adi-radio.com>



Don't Let the "Main Event" in Private Wireless Start Without You!

For private wireless licensees, radio equipment dealers, communications service providers and government officials—this show is a must. It's your chance to shop for the latest products and technologies, get training on operating and marketing new equipment and to learn about the latest legislative initiatives.

**Call (703) 528-5115 now to make
your reservation at the greatest show in
private wireless!**



Industrial Telecommunications Association, Inc.

TOTAL FREQUENCY MANAGEMENT

1110 N. Glebe Road, Suite 500 • Arlington, VA 22201
(703) 528-5115 • (703) 524-1074 • www.ita-relay.com

The 2000 Private Wireless Spectrum Management Conference and Exposition

Co-sponsored by the Industrial Telecommunications Association (ITA), The Council of Independent Communication Suppliers (CICS), and USMSS



**October 4-7, 2000
Grand Hyatt Hotel, Washington, DC**

SLA batteries offer vent flame arrestor

Panasonic's MSE series of valve-regulated, lead-acid batteries are designed for telecommunications applications and are fully front-accessible. The batteries do not require watering, and they draw a low float current. MSE batteries have a cover-to-jar heat seal and a safety vent with built-in flame arrestor.

Batteries are available in 24V, 48V and 480V configurations with capacities of as much as 5,750Ah in parallel strings. The models in the MSE series are rated from 150Ah to 1,440Ah at the eight-hour rate.

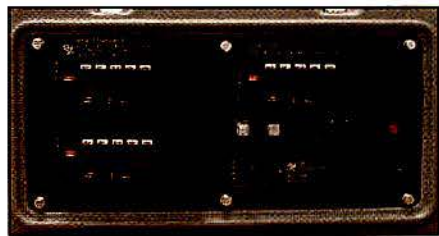
CIRCLE (411) ON FAST FACT CARD

Software supports TDMA development

IFR Systems' teleservices software module version 4.4 supports operators and developers of TDMA systems. The software module is available for the IFR 1900-4 and the 1900-5 radio test platforms. It allows designers and operators to simulate broadcast short-message services, enabling them to develop enhanced messaging services for ANSI-136 digital mobile phones.

CIRCLE (412) ON FAST FACT CARD

Repeater operates in several modes



The KTR-25 from King Communications is a portable tactical repeater with 256-channel capacity. The repeater offers an alphanumeric display and is capable of operating in analog, Smartnet II, Smartzone and Project 25 trunking modes. It can operate as a UHF repeater or as a UHF link with a VHF link, or it can be used as two independent UHF radios and an independent VHF radio.

CIRCLE (413) ON FAST FACT CARD

Headset combats high-noise environments

Motorola's noise-canceling headsets are designed for two-way communications in high-noise environments. The dual-muff headsets are available in headband or hardhat-mount styles and offer noise reduction quality of 22dB(A). Two microphones, included on the outside of the earcups, reproduce ambient sound back into the headsets. Harmful sounds are suppressed to a safe level, and low sounds are amplified as much as five times the original level.

CIRCLE (414) ON FAST FACT CARD



TOUGH x 2

OTTO Remote Speaker Microphones set new standards in durability, reliability and performance, as well as provide high-clarity sound – even in high-noise environments.

- Designed to meet MIL-STD-810E specs.
- Fully-sealed housing survives harsh environments, including 40 mph blowing rain.
- Million-cycle push-to-talk switch.
- Heavy-duty cable assembly withstands 25,000 flex cycles.
- Earphone jack accepts standard 2.5mm plugs.
- Clothing clip rotates 360°, with detent stops every 45°.
- Include integral connector interface to major radio models.



V2-L

Specify the V2 Series when noisy environments dictate added features like a two-position, high/low volume control. Emergency buttons are available, as are antenna versions of some models.

The V2-L Series is the perfect choice for those that can accept fewer features in order to reduce speaker mic costs. Lighter and slimmer than the standard V2 Series, the V2-L still delivers premium audio performance.



V2

OTTO Speaker Microphones are compatible with a wide variety of radio makes and models. Contact us today for the most current copy of our Price List.



OTTO
COMMUNICATIONS®

A World of Sound Ideas

Carpentersville, IL ♦ Toll-free: 888-234-OTTO ♦ Phone: 847-428-7171 ♦ Fax: 847-428-1956
comsales@ottoeng.com ♦ www.ottoeng.com

CIRCLE (60) ON FAST FACT CARD

CRESCEND TECHNOLOGIES

1st In Class RF Power Amplifiers

- UHF
- VHF
- 900MHz
- 30-88MHz Military

Special Introduction:

Next generation 100w SMR power amplifiers. Our H100 series is designed for 450-470 MHz continuous duty applications. Featuring adjustable 10W-100W output, Remote Status and Fault Monitoring. Fully modular and space efficient fitting into 3.5" rack space allowing up to five modules per 10.5" rack space. Also available in 850-870 MHz band.

Phone (800) 872-6233
Fax (847) 593-1320
www.crescendtech.com

Crescend
TECHNOLOGIES

CIRCLE (61) ON FAST FACT CARD

It's here...
**Industrial Machinery
AUCTIONS**
on the Internet!

Industry will never
be the same.

AUCTIONS
Machinery and Property
-Plus-
Machinery for Sale
Businesses for Sale
Commercial Real Estate
RFPs and RFQs
Employment
Funding and Capital
E-mail Notification Services

**i-com
industry**

www.i-comindustry.com

CIRCLE (62) ON FAST FACT CARD

PEOPLE



Farrow



Sexton



Urlick



Jessip

Changes at Wood & Douglas, Baughurst, United Kingdom:

Martin Farrow departs Yokogawa Marex Technology, Cowes, Isle of Wight, as marketing manager to join Wood & Douglas as business development manager. **Rachael Penfold** leaves Radio Frequency Investigation, Basingstoke, Hampshire, as development manager, to join the company as broadcast product manager.

Promotions at Sabre Communications, Sioux City, IA:

Rolli Sexton moves up from inside sales manager to national sales manager. **Sarah Urick**, sales manager, advances to marketing manager. **David B. Jessip** moves up from director of sales and marketing to the position of vice president of sales.

Reimer Nagel, research and development manager for Radio Frequency Systems, Marlboro, NJ, accepts appointment to senior vice president.

J. Michael Gearon, executive vice president of American Tower, Boston, advances to the position of president.

William F. Schwartz, retail and advertising manager for the *Washington Post*, moves to the position of marketing manager at Metrocall, Alexandria, VA.

Mike S. Zafirovski, president of GE Lighting, replaces James A. Norling as president of the personal communications sector at Motorola, Schaumburg, IL.

Michele C. Farquhar, a partner in the law firm of Hogan & Hartson, succeeds Paul B. Najarian as president of the Land Mobile Communications Council.

Allen Groh, director of international trade & regulatory compliance for Ericsson, Stockholm, Sweden, assumes the position of chairman of the TIA's technical regulatory issues committee.

Steven M. Nielsen, vice president and general manager of Nextlink-Washington, McLean, VA, advances to chief financial officer of Independent Wireless One.

Changes at JBro Batteries, Lisle, IL:

Donald Riley rejoins the company as vice president-distribution sales. **Alan ElShafei**, electronic battery engineer for TDI Batteries, joins the organization as vice president-engineering.

Harlan Plumley, chief financial officer of Marcam Solutions, Irvine, CA, joins Lightbridge, Burlington, MA, as chief financial officer.

Arkady Shkolnik, North American sales director for VLSI/Philips Semiconductors, San Jose, CA, advances to vice president of sales for Widcomm, San Diego.

CLASSIFIED



Dawn Rhoden
Classified Advertising
Manager

Reserve your spot in the next issue!

Phone: 913-967-1861

800-347-9375

Fax: 913-967-1735

Mail: 9800 Metcalf Ave.,
Overland Park, KS 66212

Category Index

Computer Software	86
Employment	77
Equipment For Sale	77
Paging	77
Professional Consulting Services	75
Professional Services	75
Rentals	85
Repair Services	86
Trunking	87
Tower Space	87

PROFESSIONAL SERVICES

FREDERICK G. GRIFFIN, P.C.



2938 Waterlick Road
Lynchburg, VA 24502
(804) 237-2044

NATIONWIDE COMMUNICATIONS CONSULTING

Mobile Radio, Microwave, E9-1-1,
CAD, Paging, LAN,
Dispatch Communications Centers
Multi Site Propagation Analysis

PORTA-TECH

PORTABLE TECHNICAL SERVICE, INC

121 Crowell Lane • Lynchburg, VA 24502

FACTORY TRAINED
TECHNICIANS FOR
QUALITY SERVICE

GE Portable Radio Service Depot Factory Approved Nationwide

- Current Product Lines
- Voice Guard Certified
- Public Service Trunking
- Surface Mount Technology

ERICSSON

(804) 239-3049

MCCON

Mobile Communications Consulting
S.R. McConoughey, P.E.
Principal

13017 Chestnut Oak Drive
Gaithersburg, MD 20878 (301) 926-2837



OMNICON, Inc.

COMMUNICATIONS ENGINEERING

GENE A. BUZZI
PRESIDENT

930 THOMASVILLE ROAD, SUITE 200
TALLAHASSEE, FLORIDA 32303
PHONE: (850) 224-4451 • FAX: (850) 224-3059
E-mail: omnicom@omnicom-usa.com



SCHWANINGER & ASSOCIATES

Attorneys at Law

Robert H. Schwaninger, Jr.
1331 H Street N.W. Suite 500
Washington, DC 20005
Ph- 202-347-8580
Fax 202-347-8607

GE PORTABLE SERVICE

- FAST TURN
- WARRANTY
- \$48.00 hr./2 hr. MAX
- PARTS GE LIST
- RETURN UPS PAID



Smith Communications Service

2121 W. Parrish Ave., Owensboro, KY 42301
270-683-0936



COMMUNICATIONS GROUP

RAYMOND C. TROTT, P.E.
Chairman

1425 Greenway Drive, Suite 350
Irving, Texas 75038
972/580-1911 • Fax: 972/580-0641

THE PORTABLE DEPOT, Inc.

KEEPING AMERICA COMMUNICATING FROM COAST TO COAST

- FACTORY TRAINED TECHNICIANS •
- SURFACE MOUNT TECHNOLOGY •
- FACTORY APPROVED NATIONWIDE •
- EDACS & AEGIS •
- VOICE GUARD CERTIFIED •
- MPD, MPA, TPX, PCS AND ALL CURRENT PRODUCTS •

1393 Waterlick Rd • Lynchburg VA 24501

ERICSSON 804-237-3427

www.4radomes.com

VANTAGE

Vantage Associates, Inc. Manufacturing & Engineering

Gardena, CA (310) 329-0046
San Diego, CA (858) 453-3680

RADOMES
For Wireless Communications

PROFESSIONAL CONSULTING SERVICES

Engineering For The Wireless World

Wireless Communications Systems and Facilities

Define Acquire Build Manage
Design Zone Test Operate

RCC Consultants, Inc.

100 Woodbridge Center Drive, Suite 201

Woodbridge, NJ 07095

800-247-4796

email - info@rcc.com

Offices Nationwide & International

CIRCLE (100) ON FAST FACT CARD

iWCE 2001

International Wireless Communications Expo

International Wireless
Communications Expo

March 28-30, 2001

Las Vegas Convention Center

Las Vegas, Nevada USA



Join more than 10,000 industry professionals
and 350+ exhibitors at IWCE 2001, to
make the most of your connection to
the commercial wireless market.

For more information
on attending or exhibiting, call
+1-303-741-2901 or 1-800-288-8606.

Or visit our Web site:
www.iwceconexpo.com

MOBILE COMMUNICATIONS @ WORK

Public Safety Wireless Technology Decisions?



Wireless & Information Technology Consultants

Today, Public Safety Officials face major decisions in selecting which wireless and information technologies will best serve agency needs today and in the future. QRC is the first step in identifying the right solutions.

At QRC, we provide competent, unbiased technical advice concerning the full range of available technologies to support your critical public safety missions.

QRC's approach is simple yet effective: We work with your staff to define your agency's needs, and then identify candidate technological solutions.

QRC is ready to assist your agency throughout the entire life cycle of your public safety technology project—from the planning of a new communications center through the implementation of digital trunked radio system, E911, CAD, and records automation.

QRC provides expert technical and programmatic support in:

- Budget Planning and Execution
- Cost/Benefit Analyses
- Technology Evaluations
- System Specifications, Planning, and Design
- System Implementation Oversight
- Training Program Development
- System Troubleshooting and Optimization

Does your agency require privacy protected wireless communications? Is the security of your information and databases important? Do you need mobile computing today or in the future? Is NCIC 2000 right for your agency? Should you implement a Project 25 digital wireless system? How can commercial wireless services leverage your agency's limited financial resources?

QRC will work with your agency to address these questions and other technology issues in all areas including:

- Integrated Digital Voice and Data Technologies
- Emerging Wireless Technologies
- Project 25 Digital Communications Systems
- NCIC 2000 Technologies
- Commercial Services, such as CDPD and 3G Wireless
- Trunked, Conventional, and Rapid Access Trunked Systems
- Simulcast and Mobile Computing
- Communications Operations Center Design
- Coverage and Propagation Studies
- Enterprise Networking
- Intelligence Analysis Automation
- Information Security and Privacy Protected Systems
- Surveillance and Title III Technologies

For information on how QRC may assist your agency in its Public Safety Technology decision process, contact us at: Quantum Radionics Corporation, 2121 Eisenhower Avenue, Suite 200, Alexandria, VA 22314, Voice: 703.684.8548; Telefax: 703.684.9505; e-mail us at info@quantum-radionics.com or visit us at www.quantum-radionics.com

- Advancing Technology Through the Millennium -

© Copyright Quantum Radionics Corporation 1999

EQUIPMENT FOR SALE

Wireless System Manager

If you thrive in a fast-paced team environment and enjoy a challenge - we want to talk to you!

The Telecommunications team of City Utilities of Springfield, Missouri is seeking an individual with a minimum of five years of recent progressively responsible experience in the management, operation and maintenance of a Motorola 800 MHz public safety multi-disciplined trunked radio system and associated infrastructure. A Bachelor's degree in Public Administration, Computer Science, Electronic Engineering or related field is required. This experience must include a theoretical knowledge of radio communications and an understanding of the fundamental theory of operation of an 800MHz trunked system. The successful candidate must qualify and quantify this experience. Must have a working knowledge of methods and practices with public safety radio communications equipment specifications, installation, and maintenance. Actual experience with the operation of two-way computerized radio systems from both a dispatch and user's perspective and familiarity with FCC rules and regulations is required. Good communication skills and interpersonal skills are a necessity.

City Utilities is a progressive, multi-service municipal utility (including Telecommunications Services) serving the community of Springfield, Missouri. Springfield is located in the heart of Ozarks lake country, offers an excellent family environment, numerous recreational opportunities, a low cost-of-living, and is the primary trade center for southwest Missouri and a four-state area.

City Utilities offers competitive salaries and excellent benefits, including health and life insurance and educational assistance. Interested applicants meeting these job qualifications should send their resume and salary requirements to the address below or apply in person at 301 East Central, Springfield, Missouri.

CITY UTILITIES OF SPRINGFIELD, MISSOURI

Employment Office
P.O. Box 551
Springfield, MO 65801
(417) 831-8460
Fax (417) 831-8788
E-mail: dkreider@cityuti.com
Equal Opportunity Employer

WIRELESS STAFFING SPECIALISTS

ALL LEVELS OF POSITIONS FILLED GLOBALLY

• Technicians • Engineers • Managers • Sales

Send resume to address below

Check web page for immediate openings

WWW.PERSONNEL1.COM



PERSONNEL RESOURCES, INC.

P.O. Box 14570, Cincinnati, OH 45230

E-Mail: Careercom@AOL.com

606-491-5410 FAX 606-491-4340

Electronic Technician

Large Metropolitan dealer is looking for an experienced Electronic Technician. Previous experience working on two-way radio communications systems, including installation and maintenance is required. Salary commensurate with qualifications and experience. Benefits. Send resume to:

Mobile Radio Engineering, Inc.
745 Boone Ave. N.
Golden Valley, MN 55427
e-mail: ddavey@visi.com

Visit the Website
www.mrtmag.com

PAGING

WIRELESS MODEMS

with
Hard-Wired
Performance



RS-232 Plug and Play

9600 Baud Data Rate

Range Up To 20 Miles

2W and 5W Output Models

25KHz and 12.5KHz Bandwidths

Error-eliminating RDXP™ Protocol

Synthesized VHF and UHF Models

Built-in Store & Forward Repeater

Skyline™ wireless modems utilize licensed VHF/UHF frequency bands for reliable, long distance data communications without the problems common to "spread spectrum" units. With longer range and built-in store and forward, Skyline modems perform like they're hard-wired.



Sonix Technologies Corporation
310 Via Vera Cruz, Suite 111 San Marcos, CA 92069
Tel: 760-752-1011 Fax: 760-752-1411
email: sales@sonix.com

www.sonix.com

CIRCLE (102) ON FAST FACT CARD

Want more information on advertised products?
Use the Reader Service Card!

EQUIPMENT FOR SALE

WE
BUY
AND SELL
USED
MOTOROLA,
GE AND
ERICSSON
FM
TWO-WAY
RADIOS

SCHAEFER
RADIO CO.
130 West
Fayette St.,
P.O. Box 395
Denver, IA
50622
PHONE:
(319)
984-6115
FAX:
(319)
984-6220

6ea. PURC 5000 Bases, 900 MHz, C85JLB1101A
8ea. MICOR PURC Bases, 900 MHz, C75ZB1101A
1ea. SMARTNET Trunking Controller, T5076A
3ea. MICOR Rptrs. 800 MHz, C55RCB5103AT
1ea. TXRX 5 Channel Combiner
5ea. GTX, 800 MHz, M11UGD6CB1AN
7ea. MTX 8000, 800 MHz, H01UGC6DB3AN
23ea. MAXTRAC, 800 MHz Conv. D35MJA77A4AK
30ea. RADIUS P200, 490 MHz, H44RFU7120BN
66ea. SPECTRA, 460 MHz, D44KMA7JA5BK
9ea. MARATAC, 460 MHz, T74XTA7TA7BK
1ea. MICOR Comm. Rptr. 460 MHz, C64RCB1105AT
6ea. MICOR Bases, 460 MHz, C64RCB1105AT
2ea. R100 Repeaters, 460 MHz, H5016B
12ea. SYNTOR X 9000, 460MHz, T74KEJ7J04AK
90ea. SYNTOR X 9000, 460 MHz, T34KEJ7J04AK
36ea. SYNTOR, 460 MHz, T44SR3200
18ea. GM 300, 460 MHz, M44GMC29C3AA
11ea. M100, 460 MHz, D34LR73A5BK
27ea. SM 120, 460 MHz, M44GMC20C2AA
20ea. SM 120, 460 MHz, D34OG20C2AA
45ea. PAC RT, 460 MHz, H14TT73110A
2ea. MT1000, 460 MHz, H44GCU7100BN
42ea. MARATAC, 155 MHz, T73XTA7DA3AK
99ea. SYNTOR, 155MHz, T83SRA3000AK
53ea. MAXTRAC, 155 MHz, D43MJA73A5CK
29ea. PAC RT, 155 MHz, H13TT73110A
30ea. MARATAC, 48 MHz, T81XTA7DA3AK
99ea. MITREK, 48 MHz, T81JA4000
10ea. MICOR Base, 37 MHz, C71RTB1405
30ea. MARATAC, 37 MHz, T81XTA7TA5BK
10ea. MAXTRAC, 39 MHz, D51MJA93A5AK
1ea. MITREK Base 33 MHz, L71JB1490
99ea. MITREK, 35 MHz, T81JA4900DK
4ea. SYNTOR X, 33 MHz, T71VB7204
100ea. Motorola SYSTEMS 90 Sirens
WANTED: RADIUS Mobiles, Portables, & UHF SYNTORS

EQUIPMENT FOR SALE



Communication Test Equipment

IFR Com120B	\$13,000	IFR 500A	\$3,900
Motorola R2012D ...	\$10,000	IFR 1200	\$5,500
HP 8920A	\$9,750	IFR 1200 SuperS	\$8,750
Marconi 2955	\$2,750	IFR 1500	\$6,500
Sage 930A	\$3,000		

EML will buy your used test equipment.

We accept:

(888) 846-4614 • www.eml1.com

CIRCLE (103) ON FAST FACT CARD

EMPLOYMENT

Motorola Service Technician Needed

Winchester based Motorola Service Center is seeking qualified radio/pager technicians. Applicants must be able to install, maintain, and repair all facets of Motorola/Uniden two way equipment including repeaters, trunking mobiles and portables, conventional portables and mobiles. Repair to the component level is a must. Knowledge of DOS, Windows is necessary. Some field work will be required. Salary based on experience, (minimum 2 years required) and experience. Excellent benefit package available including health, 401K. Relocation assistance is available to hired applicants. Fax resumes with experience and equipment that you have worked on to: Valley Two Way, Inc. Attn.: Mike Doty at (540) 723-6653 or E-mail: vtw@visuallink.com Equal Opportunity Employer

TECHNOLOGY THAT HITS HOME



Make waves globally. Create the next generation of wireless for cell phones, smart cars, traffic management systems. Hit the airwaves with M/A-COM, the frontrunner in RF, microwave and millimeter waves technology.

As a member of our team, you'll enjoy the resources of Tyco International Ltd., our parent company. You'll have the opportunity to sharpen your skills and advance your career. Hit your stride in a dynamic, rewarding environment. Make waves with M/A-COM.

OpenSky Implementation Manager

Based in Harrisburg, PA

Successful applicant will have a mix of Systems Engineering and Project Management experience in leading RF communication Projects for Public Safety customers at the State, County, and Municipal level.

Engineering background should include technical familiarity with large cellular digital network design, and knowledge of Public Safety Technical requirements is a must. Portable and mobile radio's base stations, dispatch consoles and communications software for Public Safety Applications. Applicant must be able to successfully interface with customers' technical staff as well as State, County, and Municipal leaders.

Applicant should have a BSEE or EQUIVALENT with ten years' experience plus 5 years' Project Management experience. This is a unique and exciting opportunity to become a key member of the M/A-COM Program Management Team deploying M/A-COM's OpenSky Digital Communications solutions. Job Code: JC-99-OIM

If interested please forward your resume indicating job Code to: M/A-COM, Attn: Employment & College Relations, 1011 Pawtucket Boulevard Lowell, MA 01854; Fax: 978-442-4443.

E-mail responses may be sent to chartiej@tycoelectronics.com

An Equal Opportunity/Affirmative Action Employer.

tyco
Electronics

M/A-COM

For more information, please visit our website at:

www.macom.com

GTX

LTS 2000

LCD's Repaired @ \$69 ea

718-783-6000

Buy & Sell

Motorola, Uniden, E.F. Johnson, Kenwood
Two-Way Radios and Systems

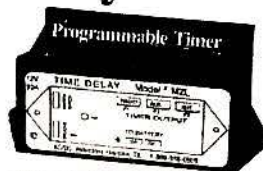


**DELTA
COMMUNICATIONS**

1-800-880-2250
FAX: 972-278-5085
Garland, TX

<http://www.delta-two-way.com>

Delay Timer



Battery Protection Device

Low Voltage shuts down load

Allows retrieval of incoming messages

For Two-Way Radios, Mobile

Computers, MDT, Cellular Phones,

Mobile Video System

Designed for Public Safety Vehicles & Industrial Communications Systems.

30 AMP 12 Volt DC

Low voltage detector (11.5 V)

Over voltage protection (16 V)

Built-in diagnostic LED

Sealed for moisture and vibration

Reliable and accurate

Compact - Easy to install

Low cost

One year warranty

AC/DC INDUSTRIES

P.O. BOX 710548, HOUSTON, TEXAS 77271

Tel: (281) 933-0909 • Fax: (281) 933-1001

e-mail: globe@brokersys.com

web: www.acdcindustries.com

CIRCLE (104) ON FAST FACT CARD

PROGRAMMING CABLES FOR MOTOROLA PRODUCTS

HT1000, MT2000—\$70

GP300, P110—\$50 • VISAR—\$110

HT600—\$48 • MOBILES—\$25 • SABER—\$55

HT50—\$50 • STX—\$35 • SPECTRA—\$35

PROGRAMMING INTERFACE—\$95

ROADRUNNER COMMUNICATIONS

11-C Harts Lane • East Brunswick NJ 08816

Phone: 732-254-3232

Fax: 732-698-0555

Sacramento Communications Surplus

22	Motorola STX H35JWC5170BN 3 button display 800 MHz	\$100
18	Kenwood TK311 900 MHz LTR portable no batt no chrg	\$75
04	Standard HX-482UT UHF 450-470 MHz LTR/conventional	\$200
	w/ rapid chrg	\$200
20	Motorola MCX 100 VHF 10W 16f dash mount w/DVP (NOS)	\$150
25	Motorola Mostar D35LA5G00DK 800MHz 15W 16SYS	5 for \$100
16	Johnson 8700 800MHz LTR 15W	5 for \$100
20	GE Delta/Ranger DES Voice Guard 19A148909P10	\$75
01	Motorola People Finder Plus Paging System w/ 3 page's model #E34PFD011AS 464-500MHz	\$350
03	Motorola System 9000 Siren Control HLN1185B	\$125
01	Telewave TX UHF Combiner M-101-405-4TRM 406-512 MHz 4 channel -- will tune on your freqs	\$2800
50	Motorola Micor/Mitrek/Syntor DTMF mic (NOS)	\$40
300	Buss heavy duty fuse holder HEJ-BB w/sc 40 fuse (NOS)	3 for \$10
01	Zetron Model 15P multi format digital encoder (NOS)	\$250
01	Motorola Radius R-100 25w UHF 450-470 MHz PL DPL	\$550
01	Motorola Micor Purc UHF 450-470 MHz 75 w Paging TX	\$1200
	#64ZB1106A	\$1800
01	Motorola Micor Purc B93ZB1106A 370w VHF	\$1800
02	Motorola Micor 72 MHz Repeater 42RCB6105B	\$1200
01	Digital Microwave Corp 17/19 GHz TX/RX	CALL
01	Glenayre 1205 Radio Telephone Terminal	CALL
01	Glenayre 3000 Paging Terminal	CALL
01	Zetron Model 4042A 3 position Dispatch Console-Complete	CALL
10	Motorola Micor 64RCB3105BT 75w 450-470 MHz PL repr	\$1200
02	Motorola Micor 64RCB3198BT 75w 470-490 MHz	\$1000
	repeater 4 user PL	\$1000
10	Motorola Micor 71RCB3105B 100w 42-50 MHz	\$900
	intermittent duty base (unfilled chassis)	\$150
180	Standard HX-482T 800MHz LTR Portable 10 sys Alpha Display	\$150
80	SEA 220MHz ESP 1000 repeaters & Tri-ident Controllers	CALL
40	Standard HX-580-800 MHz LTR portable	\$150
21	Johnson 8640 900 MHz LTR mobile w/ acc	\$125
75	Motorola MTR 8000 H01UC60B3AN w/ rapid charger	\$250ea
50	Motorola MTR-800 Single System w/ rapid charger	\$150 ea
100	Motorola Saber 1 UHF 450-470 MHz 12F 4w w/used bat	\$275ea
20	Motorola Visar H05UC60B1AN 800 MHz trunking Type 1 w/ rapid charger	\$200ea
42	Kenwood TK-353 UHF 450-470 MHz LTR/Conventional 4w, Alpha Display, Scan, w/rapid charger	\$175ea
07	Zetron Trunking Controllers -- Model 42	\$400
03	Zetron Trunking Controllers -- Model 49	\$900
50	Motorola Saber Speaker Mic Model NMN6128C	\$50
50	Motorola STX Speaker Mic NMN6184A	\$60
50	Motorola STX Speaker Mic NMN6177A	\$50
125	Motorola MT-1000/MTX 8000/MIS 2000 spk mic NMN6193B	\$30
17	Motorola Maratrac VHF 110 W A2/A7 Heads w/acc	\$450
40	Johnson 8615 800 MHz mobile w/o acc	\$100
30	Motorola Maxtrac LS 800MHz LTR mobile w/acc	\$175
75	Motorola Maxtrac B1/B5 800 MHz mobile w/o acc	\$100
75	Uniden NR-8100 Public Safety Scanner w/o bracket & spkr	\$150
20	Motorola Mitrek 110W VHF w/acc	\$175
50	Motorola Mitrek 40W UHF w/acc	\$100
6	Standard RP71K 800 mhz desktop repeater	\$550
2	Motorola MTR-2000 VHF 100w repeater	CALL
2	Motorola Micor 800 mhz repeater 75RCB6105AY	\$1200
1	Johnson PPL series 460 mhz repeater	\$750
1	Johnson PPL series 490 mhz repeater	\$750
1	DB Products DB-200 800 mhz duplexer	\$375
1	TE systems 8814HR 800 mhz repeater amplifier	\$450
2	Midland 70-055C base station 42-50 mhz	\$225
10	Motorola Maxtrac 800 D35MWAGB7BK w/ acc	\$225
Lot	Misc Midland Mobiles LB, VHF, UHF, 800 mhz	CALL
	WANTED: MOTOROLA MTX-8000/9000	

Toll Free: 1-800-811-4241

Ph: 916-782-1225 • Fax: 916-782-9588

web site: www.sac-surplus.com

CIRCLE (105) ON FAST FACT CARD

BUYING ERICSSON - GE EQUIPMENT

SYNTOR XX 30-50 100W w/acc	225
VHF/ UHF Voting aux receiver	395
MASTR II VHF/UHF 100/250w Sta.	CALL
FLAT RATE REPAIR S-990 & S-950	60
ASTRON RS12A Black P.S. NEW	50
MASTR Controllers	135
RCN 1000 Remotes	135
IDA Control Shelf, new from	200
EDAC RANGR mobile, new boxed	100
S990 128 ch head w/warranty	125
S950 128 ch head w/warranty	75
S550 Scan control head min	225
Phoenix-SX 16Ch VHF w/acc	150
MLSH040 /041 VHF MLS w/acc	250
MLSL160/161 30-42 w/acc	250
GE Rapid desk charger w/MPA/PCS/LPE/MRK insert	64
KPC 300 Ericsson VHF & UHF Port	225
KPC spk/mic w/ coiled cord mint	35
MPA/MPD Std. rate chargers	25
Rangr 30-42 less acc. 100W NEW	325
Rangr 35-50 less acc. 60W NEW	250
Delta-S 450-470 less acc. 100W	250
Delta-SX 150-174 less acc. 100W	250
Delta-S 42-50 less acc. 110W	150
Delta-S 42-50 less acc. 60W	100
Delta-S 29-36 less acc. 110w	150
MASTR II 150-174 / 29-36 110w	125
MRK/MPA Spk/mic/ant less ant new	25

NEW LONDON TECHNOLOGY

752 Alum Springs Road • Forest, VA 24551

Tel: 804-525-0068 • Fax: 804-525-0078

www.newlondontech.com

A Passion For Excellence.

Call Today For Your FREE Catalog!

www.antenex.com

The image shows the cover of the Antenex catalog. It features a collage of various antenna products, including mobile antennas, base station antennas, and repeaters. The Antenex logo is prominently displayed in the center, with the word 'ANTENEX' in large, bold, red letters. Below the logo, there is a list of 'New Products' including the 'Range' series, 'Saber' series, 'Maxtrac' series, and 'Visar' series. The background of the catalog cover is a blue and white cityscape.

Antenex is an established leader in the design and manufacture of innovative antenna products. Our latest Antenex Catalog is the perfect reference and buying guide for dealers. It features new products, as well as color photos, graphs, patterns, detailed descriptions and specifications of our full line of antenna products.

United States:

Phone: (800) 323-3757

Fax: (800) 851-9009

International:

Phone: (630) 351-9007

Fax: (630) 351-9009

Antenex Inc., 2000-205 Bloomingdale Road • Glendale Heights, Illinois 60139

CIRCLE (106) ON FAST FACT CARD

BUY • SELL • Trade

JUST ARRIVED ***** MIDLAND MOBILES
Lowband, VHF, UHF -- Front and rear
mount -- Accessories also available.

Large selection of MASTR II Bases & Repeaters
on Low and High Band & UHF

GE MASTR II and Mot Micor Base Station Cards
-- 20% off our already low prices

WOLFE
COMMUNICATIONS

1113 Central Avenue

Billings, MT 59102

Phone: 406-252-9220

Fax: 406-252-9617

http://members.aol.com/cwwolfe.com

COMPLETE CHANNEL ELEMENTS
YOUR FREQUENCY
LIFETIME GUARANTEE
Most Elements \$20.00 with Trade

Crystals
We Buy Used Elements

NKX

1814 Hancock St.

Gretna, LA 70053

504-361-5525 (in LA) • 800-237-6519

FAX 504-361-5526

MOTOROLA RADIOS FOR LESS

HIGH QUALITY • EXCELLENT VALUE

WETEC**Authorized Motorola Distributor***Specializing in Local, State & Federal Agencies***WE SELL MORE FOR LESS THAN ANYBODY 1-888-GO-WETEC**Visit our Website www.wetec.com

(1-888-469-3832)

**Lowest Prices
Anywhere!
Why Pay More?**

CIRCLE (107) ON FAST FACT CARD

FOR SALE

Large quantity of Motorola MCS 2000 Model 2 mobiles. Model M01HX+824W (M01UJM6PWAN). Excess inventory never used, original packaging, latest firmware upgrades. Units are approx. 3 years old. Call Bob Chapman at Conectiv Power Delivery (302)283-5835 or e-mail robertchapman@conectiv.com

NEW in box ERICSSON #MLS II, low band 60 watt Mobiles w/8 channel control panel w/ scan, 42/50 MHz, 12 units. List \$1145, Dealer \$687. Sale price \$359 each.

FUTURE COMM.

609-371-4811 • FAX 609-371-4813

WE SHIP ANYWHERE IN THE WORLD!

ONE WEB SITE - ONE SOURCE
THE ONLY SOURCE YOU NEED!WWW.COMMUNICATIONSWEST.COM

NEW INVENTORY!

TK-353K \$199.00!

Includes battery and Charger!

TK-830GK 35W \$275.00!

TK-270 & TK-370 \$299.00!

Includes battery and Charger!

MOTOROLA

PRO7150 UHF \$470

Includes battery and Charger!

KENWOOD**ICOM****Radius****MOTOROLA**

Special State & Local Gov. Discounts

1-800-264-9516

FAX 303-415-1557

COMMUNICATIONS WEST, LTD.E-Mail: commwest@aol.com

DOMESTIC & EXPORT SALES

LOWEST PRICES!

SM-120

SPECIAL PRICES and in STOCK!

Mobile Radios

UHF 450-470 MHz VHF 150-174MHz

Features:

16ch operation All-Channel Scan



25 or 40W TX Power

All SM-120 radios include Plain mic, power cable, mounting bracket

info@nsiradio.comwww.nsiradio.com**NSI Communications**

Tel: (206) 870-0888

Fax: (206) 878-4212



SM-120 trademarks of Motorola Inc.

Radio Programming Cables

Model #	The Motorola® Radio It Programs	Price
1	HT50 and the Radius P100 Models.	\$59. ⁹⁵
2	HT600, MT800, MT1000, P200, P500, MTX800, MTX810, MTX820, MTX900. (connection on top of radio)	\$85. ⁹⁵
3	MARATRAK. (MAXTRAC - 50, 100, 300, 820, 840, M860)	
4	(RADIUS - M100, M206, M208, M214, M216, M400, GM300), SM10, SM50.	\$59. ⁹⁵
3B	MCS-2000	\$59. ⁹⁵
4	STX, STX Gemini, STX 821 trunked portables.	\$79. ⁹⁵
5	SABER and System SABER.	\$99. ⁹⁵
6A	SPECTRA Low and Medium Power Units.	\$79. ⁹⁵
6B	SPECTRA 100 Watt and High Power Units.	\$79. ⁹⁵
7	SYNTOR 9000 and 9000E Radio Line.	\$149. ⁹⁵
8	Radius P 50 Plus.	\$95. ⁹⁵
9	R100 Repeater.	\$49. ⁹⁵
10	MCX1000.	\$65. ⁹⁵
11	Cloning Cable for the Motorola® HT600 / MT1000.	\$79. ⁹⁵
12A	GP300, GP350, and P110 Models.	\$149. ⁹⁵
13	MSF5000 Digital Unit with 3 Digit Display in Controller Tray.	\$75. ⁹⁵
14	HT1000, MT2000, MTX 838, MTX 8000, MTX 9000 (connection on side of radio) and JEDI Series.	\$135. ⁹⁵
15	Visar Unit.	\$119. ⁹⁵
16	Cloning Cable for the Motorola® JEDI Series.	\$129. ⁹⁵
17	ASTRO SABER and SABER SI.	\$99. ⁹⁵
18	SP50.	\$99. ⁹⁵
19	M1225.	\$59. ⁹⁵
20	P1225.	\$119. ⁹⁵
21	HT750, HT1250.	\$79. ⁹⁵



Your Order Shipped Same Day! Order by 1pm EST.

Polaris Industries

Tech Info: 404.872.0722

www.polarisradio.com**Compare These Important Points, Before You Buy!**

- We Accept: American Express, Discover, MasterCard and Visa.
- Professional Users Guide with Detailed Photos Included with All Radio Products.
- Compare Polaris' Features and Quality. Don't Accept Imitations!

Compatible Motorola® Radio Programmers**PA-I Programming Adaptor...\$139.95**

- Compatible with "RIB" unit.
- Rugged steel case.
- Power LED.

PA-II Programming Adaptor...\$159.95

- Contains rechargeable NI-CAD Batteries.
- Perfect for field use and Portable, Laptop & Notebook Computers.
- Status LEDs: Power On and Charge.
- Power Switch.
- Power / Charger Included.
- Runs for 8 continuous hours, from a full charge.

**PA-III Pocket Programmer...\$189.95**

- Micro-Size Design for Convenient Portability and Field Use.
- Uses Surface Mount Technology.
- Rechargeable — Works hours on one charge.



NOTE: Hardware Only.
Software sold by Motorola®
and other products are
Trademarks of Motorola®, Inc.

American Express Discover MasterCard VISA
Polaris Industries Inc.
470 Armour Dr. NE • Atlanta GA 30324
FAX 404.872.1038


1-800-752-3571

CIRCLE (108) ON FAST FACT CARD

Audio Accessories for 2-Way Radios!

Klein
electronics
(800) 959-2899
Fax: (760) 796-6369
E-mail: info@kleinelectronics.com
Web: www.kleinelectronics.com
Call Now!

**K112-
"Comfortable"**



2 Piece
Lapel Mic

**K500-
"Top Seller"**



Dual Muff Headset
for Safety Helmets

**K400-
"Best in Class"**



Dual Muff
Headset w/ Noise
Cancelling Mic

**K9725-
"Easy to Use"**



Heavy Duty
Remote Speaker
Mic

**K1000HFM-
"Affordable"**



Hands Free Mic
for IDEN Phones

CIRCLE (111) ON FAST FACT CARD

Quantity	Equipment List	Price
100+	ANDREW Holix Hangers, Ground Straps, 7/16 DIN to Male N Adapters	\$CALLS
	Hanging Grips for 7/8 and 1 5/8 Hubs	\$5000ea
10	MORTEL Small BTS Antennas (Unusual)	\$6000
01	Hop AVDITEK 6 GHz Hot Standby Digital Radio (DS3-45MB)	\$7000
01	Hop GRANGER/TELETRA 6 GHz Hot Standby Digital Radio (DS3-45MB)	\$7000
30	MOTOROLA MAXTRAC 600 Mhz BS	\$100ea
30	GE G-MARC B615	\$75ea
20	GE G-MARC B825	\$100ea
20	GE G-MARC MDS (TL800)	\$75ea
02	CENTRACOM II CEB w/30 BIMS	\$CALLS
10	MOTOROLA MICOR 800 Mhz Conv. RPTX 75W PA w/Duplexor	\$1200ea
10	MOTOROLA DARCUM 9000 DATA Radio (Unusual)	\$225ea
06	Rackwell-Gallins MIRE-2 HOT standby 6 GHz (Perfominal)	\$3000ea
50	Motorola Staxplex Channel Modems MLN287	\$150ea
35	MOTOROLA MSP 5000 UHF RPTX 100 W EPRM Type	\$2000ea
30	Motorola Staxplex Term Cards MLN28	\$80ea
06	Centracom II Consoles, less CEB	\$500ea
10	Motorola MR-600 hot-standby 6GHz 300 channel	\$1500ea
06	Fannion LRI-2 hot-standby 2.1 to 2.3GHz 48 channel	\$1500ea
08	Motorola Gigapoint 2.1-2.3GHz Radios with hot standby	\$1800ea
12	Fannion FL 1-6 GHz Radios with Hot Standby Very Good Cond	\$2000ea
20	Motorola MTX 810 Classic multi-system multi-subfreq	\$150ea
80	Granger DTL 7300 Channel Modems with E&M Signaling	\$125ea
1000	Assorted Telabs telecom signaling modules	\$CALLS
	30 DTL-7300 Shelves (add-on \$125) start up	\$150ea

New Listing! Call Charles at 336-769-2885
For more equipment visit our website at www.cmcnet.com

Wholesale Radio Communications
R C W
Your Full Service,
VALUE-ADDED Distributor of
Communications Products.

Check out our Web specials!
www.radiocomm.com

- Wholesale prices to Dealers Only.
- Self-servicing users welcome.
- We carry a wide selection of both radios and accessories for your convenience.
- We have a Flat Rate Repair service.
- We sell and install MX-COM boards.

800-726-9015 • 612-808-0069

fax: 612-808-0087

email: sales@radiocomm.com

CIRCLE (110) ON FAST FACT CARD

Talkout Problems?

Need Automatic
Transmitter Steering?



- Improve base to field coverage
- Less expensive than simulcast

We provide the tools:
You satisfy your customer.

**Simulcast
SOLUTIONS**

716.223.4927

www.simulcastsolutions.com

CIRCLE (112) ON FAST FACT CARD

TRINITY RADIO USED RADIOS at Low Prices!

- MICOR
- MITREK
- PORTABLES
- MOCOM 70
- MAXAR
- RPTX
- GE
- RCA
- ACCESSORIES
- TONE ELEMENTS
- CRYSTAL ELEM.
- BASE STATIONS

(940) 433-5452 • trinity-radio.com

• BOARDS • STRIPS • ACCESSORIES • ELEMENTS • REEDS •
PCI — PEKAAR COMMUNICATION INC.
Steve's back, formerly of Gregory Electronics Corp.
\$ Specials of the month \$
GE Rangr 36-50 range 40W w/accessories \$195
GE MVS Mobile high band w/mic \$175
Motorola Mitrek T34JJA 40 watt UHF 450- 470 range 4 freq. less access. \$35
GE Exact II 40W table top base high band or low band \$75
Motorola systems 90 control heads 4 freq. and many other options \$20
GE MLS mobiles high band, with mic & orackit \$185
GE MPA Portable 16ch high band with antenna & battery \$200
Motorola Mitrek T34JJA 40 watt UHF 450- 470 range 4 freq. less access. \$35
GE PHOENIX Mobile NS-H1W40TB—high band dual priority scan/grey case with accessories \$195
GE PCS Portable 470-490 range w/battery & antenna \$175
MOTOROLA Mitrek 39-50 range 100W w/accessories \$150
REGENCY Mobile model BTH201 high band \$20
MOTOROLA Micor 42-50 range 100W range w/accessories \$100
Catalog Available...If you can't find it, try us! Call (973) 772-0704 or fax (973) 340-1902
• REEDS • ELEMENTS • ACCESSORIES • STRIPS • BOARDS •

• BUY • SELL • TRADE •

VOCOM RF POWER AMPLIFIERS MODELS AVAILABLE:

- ♦ VHF 130-175 MHz to 500 watts output
- ♦ 230-280 MHz to 100 watts output
- ♦ UHF 400-512 MHz to 350 watts output
- ♦ 800-960 MHz to 200 watts output



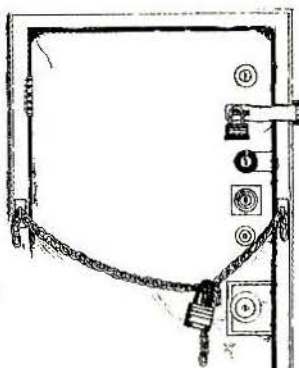
847-593-1213 • FAX 847-593-1320
sales@vocomrf.com • www.vocomrf.com



CIRCLE (109) ON FAST FACT CARD

Complete Tower Site Access Made Simple by Hark

- Control multiple sites from a central location
- Proximity Card Technology
- Temporary Pin Codes
- Remote Buzz-in
- Detailed Activity Reports
- Control up to 16 doors per site



Let Hark eliminate re-keying



1-800-367-4275 www.harksystems.com
2675 Lake Park Dr., N. Charleston, SC 29406

CIRCLE (113) FAST FACT CARD

HC ANTENNAS & BATTERIES

(Best Antenna & Battery Pricing in the Industry!!)

NMO Mobile Antennas

Low Band

HC29	29.5-35MHz quarterwave	\$15.99
HC34	34-40 MHz quarterwave	\$15.99
HC40	40-50 MHz quarterwave	\$15.99

VHF

HCQ151	151-162MHz unity gain, chrome	\$2.64
HC150	136-174MHz 3dB gain, 5/8 whip	\$13.99

UHF

HCQ430	430-470MHz unity gain, chrome	\$2.64
HC450	445-475MHz 5dB gain, 5/8 over 1/2 wave	\$13.99

800-900MHz

HCQ800	806-896MHz unity gain, chrome	\$2.64
HC800	800-900MHz 3dB gain, SMR/Cellular	\$9.99

NMO MOUNTS

HCM	3/4" hole mount, 17" RG58A/U coax, no conn	\$5.99
HCMP	Same as above, with soldered PL-259	\$6.99
HCT	Trunk lip mount, 17" RG58A/U coax, PL-259	\$9.99
HCTSS	Trunk lip mount, 17" RG58A/U coax, heavy duty stainless steel, PL-259	\$12.50
HCM3	Magnet mount, 17" RG58A/U coax, PL-259	\$12.99
HCL	Trunk gutter bracket, 3/4" hole "L" bracket	\$1.49

MOTOROLA BATTERIES & ELIMINATORS

HC9628	GP300 Battery	\$29.00
HC8148	P110 Battery	\$29.00
HC9360	GP350 Battery	\$39.00
HC7144	HT1000 Battery	\$42.00
HCBE9628	GP300 Battery Eliminator	\$29.95
HCBE8148	P110 Battery Eliminator	\$29.95
HNN9628A	GP300 Battery (original)	\$49.00
HNN8148A	P110 Battery (original)	\$49.00
HNN9360A	GP350 Battery (original)	\$49.00
NTN7144AR	HT1000 Battery (original)	\$69.00

Quantity discounts available! No minimum order!

Same day shipping!

Order entry & customer service 24 hours/7 days

Call today for our FULL LINE CATALOGUE!

Phone: 1-800-654-9550 • 973-389-9600

Fax: 973-389-9696 • E-mail: holzberg@juno.com

Be sure to visit our website at www.holzberg.com

CIRCLE (114) ON FAST FACT CARD

PORTABLES = PROFITS

NEW*

Maxon

"TP4901" **

- 900 MHz 10 System Trunking (LTR)
- Up to 100 Conventional CH.
- Programmable CTCSS ("PL")



Radio Complete
w/ Accessories **\$125**

As Above
w/out Battery **\$93**

For QTY 100+: CALL

*w/o warranty -- D.O.A Exchange only

**Private Label: Radio is identical to TP4800 Series in mechanical and most electrical components.

AIR COMM

TWO-WAY RADIO SALES

NEW*

Motorola

"P110"

- 465-495 MHz
- (Tuneable to 462 MHz)
- 4 Watt 8 Channel w/ accessories



1-18 **\$250**

19 - 48 **\$235**

49+ **CALL**

*Discontinued w/factory warranty

602-275-4505 • FAX:602-275-4555

4614 East McDowell Road • Phoenix, AZ 85008

website: www.air-comm.com • email: air-comm.com

SAVE THIS AD

CIRCLE (115) ON FAST FACT CARD

WHY PAY MORE

Air Comm: First in Quality - Price - Selection - Satisfaction

New Old Stock (N.O.S.)*

"GTX"

900 MHz LTR
2-5W Portable

\$275 (W/DTMF)

12W MOBILE

\$245



*EXPIRED FACTORY WARRANTY

"Syntor•X 9000"

Reconditioned

\$400



450-470 MHz, 100 watt
32 Freq. w/ accessories (DTMF MIC)

NEW*
"ZPC" Series

**Motorola
"P1225"**

150-174 MHz
5W 2Ch

w/ accessories

\$260



*DISCONTINUED
w/ factory warranty

NEW*

**Motorola
"SP50"**

150-170 MHz
5W 2 Ch

w/accessories
25 KHz **\$250**

12-5 KHz **\$225**

*DISCONTINUED W/
FACTORY WARRANTY



"GR500"

Wall Mount
Repeater
w/ ac Power
w/o Duplexer or
radios



**New: \$500
Reconditioned \$400**

NEW*

12-5KHz
Only

**Motorola
"GP300"**

465-495 MHz
4W 16 CH
w/accessories

\$325

*DISCONTINUED
w/ factory warranty



NEW*

**Motorola
"GP350"**

438-470 MHz
or 146-174 MHz
5W 2 Ch

w/accessories
VHF **\$275**

UHF **\$300**

*DISCONTINUED W/
FACTORY WARRANTY



NEW*

MAXON

4150L*

**136-150 Mhz
40w-16CH**

w/Accessories

\$200



*Discontinued w/2yr Factory Warranty

NEW*

**Motorola
"TS10"**

The SP10 Replacement
2 W 1 Ch UHF
w/accessories

"PL" \$155

C/52 \$125

*DISCONTINUED
w/ factory warranty



NEW*

**Motorola
"GP88"**

150-170 MHz
5W 16CH

w/accessories

\$275

*EXPORT RADIO
W/O DOMESTIC WARRANTY



NEW*

E/GE

(MFD by Maxon)

MG P148 (SP2550)

Radio-Ant. Only
5 W 10Ch

148-174 MHz

\$115

MHC2-P 30-36

(MG-P300) 36-42

5W 6 Ch C/52

w/accessories \$100

* w/o Factory Warranty



MOTOROLA

The Low Cost Alternative!

"TS11"

The "TS10" Replacement
1 Watt 1 Ch
1 watt VHF "PL" included

VHF: \$132

**APCO Special
Offer Expires
Sept 1, 2000**



AIR COMM

TWO-WAY RADIO SALES

www.air-comm.com

CALL/FAX FOR OTHER RADIOS & ACCESSORIES!

602-275-4505 • FAX: 602-275-4555 • email: sales@air-comm.com

WE STOCK "PL", Minitor II Filters, Paging Reeds, TCXOS

4614 East McDowell Road

Phoenix, AZ 85008

SAVE THIS AD

CIRCLE (116) ON FAST FACT CARD

S
A
V
E

T
H
I
S

A
D

S
A
V
E

T
H
I
S

A
D

NOT Accessories... Necessities!

- Batteries
- Headsets
- Speaker Mics
- Spring Belt Clips
- Antennas



Nothing
Works
Like a
Motorola



TelePath

TelePath Corporation

1-800-292-1700

Visit us on the Web at: www.telepathcorp.com

CIRCLE (117) ON FAST FACT CARD

Lots of New Two Way Radios!

Dealers Only

For immediate delivery

... at the very best prices!

KENWOOD
COMMUNICATIONS

YAESU

VERTEX

ICOM

Prices Starting at \$59!

Programming hardware kits \$89.00
Icom repeater maker kits \$79.00

Free Items in 20+
Radios Ordered!

Portable, Base & Mobile Antennas: Decibel, Larsen,
Maxrad, Hustler, Antenex, Cushcraft, ASP and more

Coax Cable: Belden & Hellax

Conventional and Switching
power supplies: Astron & Samlex

R.F. Test Equipment:
IFR, Bird, Optoelectronics, Ramsey

Connectors, audio accessories, batteries,
solar modules, R.F. amplifiers, Lightning
protectors, trunking panel, interconnectors....

10' tower sections. Prices start at \$33.00

Duplexers Syscom, Decibel, Wacom,
prices start at \$129.00



EPCOM

MIAMI, FL.
7262 NW, 54 St.
(305) 889-1127 FAX 889-0652
MIAMI, FL. 33166 U.S.A.
E-mail: epcom@bellsouth.net

Ask for your
free Catalog

EL PASO, TX
1630 PAISANO DR.
(915) 533-5119 FAX 542-4701
EL PASO, TX. 79901 U.S.A.
www.epcom.net epcom@whc.net

CIRCLE (118) ON FAST FACT CARD

FOR SALE H-P-8920-A

RADIO SERVICE MONITORS
QUANTITY (17) FOR SALE
WITH OPTIONS

- (5) H-P-8920-A OPTIONS 2/3/4/5/13/14/50.....\$8900
- (6) H-P-8920-A OPTIONS 2/3/4/5.....\$8500
- (6) H-P-8920-A OPTIONS 1/2/3/4/5/10.....\$8900



ASKING
\$8,500

- 500KHZ to 1GHz Frequency Range
- Spectrum Analyzer w/Tracking Generator
- Duplex Generator/Digital/Analog Signaling
- LTR/EDACKS/MPT-1327 Trunking Test
- High Stability OCXO
- 8 Month Warranty & 10-day Right of Refusal
- Tested and Calibrated

USED TEST EQUIPMENT WANTED,
FAX YOUR LIST TO +1 925-229-2035

RF IMAGING & COMMUNICATIONS
+1 925-229-2034 • FAX: +1 925-229-2035
<http://www.best.com/~rfimage>
E-MAIL: rfimage@best.com



CIRCLE (119) ON FAST FACT CARD

BUY & SELL:
LTR-800MHz & 900MHz EF Johnson • Kenwood • Uniden
MOTOROLA

UHF • VHF • 800MHz • 900MHz
• Mobiles • Portables • Repeaters • Amplifiers • Paging Transmitters

1-800-786-2199

203 N. Chestnut Street • McKinney, TX 75069
Fax: 972-562-7957

Mike Malone
www.usdtwoway.com

STERLING
ASSOCIATES, INC.
Nationwide Purchasing of Used
Two-Way Radio Equipment

We Buy
Used 2-Way
Radio
Equipment

LABELS • LABELS • LABELS

Custom Made Labels for Pagers, Cell Phones & Two-Way Radios
Distinctive Foils & Holographic Materials
Tamper-Proof Warranty Labels
Screen-Printed Labels, Signs, Overlays
Motorola Certified Pager Repair Labels
Bar Code Thermal Transfer Printing Systems

ADVANCE LABEL & TAG

1-800-466-5345
Fax: 972-548-2518

972-542-5345
www.altag.com

Don't let
time catch
up with you!
Get your ad
in today!

800-347-9375

EQUIPMENT FOR SALE

New Hampshire Communications

GE Mastr II VHF 110w cont duty amplifier, new price \$3500	\$800	Mot Syntor 110w VHF mobile, accessories	\$110
NEW GE battery back up kits, list \$783	\$110ea	Mot Syntor XX 110w VHF mobile, accessories	\$260ea
GE Mastr II 110w VHF cont duty base station, tone remote	\$1695	Mot Maxar 80 mobiles, 36-42mc, 60w accessories	\$125ea
GE Mastr II 100w cont duty base station 36 to 42 mc	\$1,195	Mot MaraTrac 110w VHF mobiles new in boxes, accessories	\$995ea
GE Mastr II VHF 110w, continuous duty repeater	\$1,495	Mot MaraTrac 100w mobiles, 36-42mc, less accessories	\$145ea
GE Mastr II UHF 100w base station	\$1,295	Mot Mitrek 110w mobiles, low band, 40-50mc, accessories	\$160ea
GE Mastr II VHF 110w cont duty rtr w/voter & aux revr	\$1,995	Mot Mitrek 110 mobiles, 30-40mc, accessories	\$175ea
GE Mastr II Base station, 42 to 50mc	\$1,100	Mot Mitrek lowband mobiles, 30-40mc, 60w accessories	\$99ea
GE Mastr I mobiles, 42 to 50mc, less accessories	\$99ea	Mot Mitrek 60w VHF base station, PL 4 freq	\$295
GE Mastr I VHF auxiliary receivers	\$325ea	Mot Mitrek 60w 30 to 40mc base station, local/remote control	\$295
GE Phoenix S UHF mobiles, accessories, 2 freq	\$160ea	NEW Mot Micor Base station receiver, 42 to 50mc with PL	\$250
GE Phoenix SX mobile, UHF 16 freq, accessories	\$180	Mot Micor mobiles, 100w, UHF, accessories	\$145ea
GE Executive II base station, 36-42 mc	\$150	Mot Micor mobiles, 42 to 50mc, 100w, less accessories	\$67ea
GE Executive II mobile, 100w, 36-42mc, accessories	\$140	Mot Micor 100w mobiles, 42 to 50mc, accessories	\$100ea
GE Delta SX 110w VHF mobiles, less accessories	\$195ea	Mot Pac-RT VHF repeaters	\$125ea
GE Delta S 110w mobiles, 42 to 50 mc, less accessories	\$140	Mot Mocom 70 base station 30 to 36mc, 100w	\$385
GE Delta SX 110w 160 channel VHF mobiles 825 heads w/ access	\$495ea	Mot Mocom 70 100w mobiles, 30-36, accessories	\$145ea
GE Delta base stations, VHF or low band, desk top or wall mount, 110w, 4 freq tone remote	\$795ea	Mot Mocom 70 VHF base station, 60w, 4 freq	\$230
GE S825 control heads	\$250ea	Mot HT1000 6 unit rapid charger	\$325
GE S550 Scan heads	\$175ea	Mot MT1000 6 unit rapid charger	\$225
GE Rangr 60w mobiles, 35-50mc less accessories	\$185ea	Mot T1600 Remotes, DC	\$95ea
GE Rangr 110w mobiles, 29 to 35mc or 35 to 50mc, less access	\$285ea	NEW Kenwood TK-200 VHF 5w, 6 freq portables	2 for \$100
GE Rangr 100w UHF mobile w/accessories	\$525	NEW Kenwood TK-760HK VHF mobile, 45w, 32 chan scan	\$400
GE Rangr base stations, VHF or low band desk top/wall mount, 110w 4 freq tone remote	\$795	NEW Kenwood TK-860HK VHF 35w, 32 chan scan mobile	\$400
GE Monitor receivers, VHF	\$95ea	Decibel Products Duplexers VHF GE P/N 19D402955P5	\$375ea
GE Desktop DC remotes	\$80	1 freq band 150 to 160mc, freq spread 2 to 12mc	\$375ea
Mot Mostar 800mc trunking radios, less accessories	\$80	NEW Maxon Programmer, Model SMP-4000C w/instruction book	\$265
Mot Flexar 40w UHF repeater w/ duplexer	\$260	Communications Products UHF Duplexer, 406-470 MHz	\$225
Mot Syntor XX 110w VHF mobile w/ accessories	\$225	Phelos Dodge UHF Duplexer, Cat. No. 526-5-SR	\$225
		Hameg 20 MHz Oscilloscopes, HM 203-5 very clean	\$110ea
		Midland 60w UHF mobile, M# 70-66B, accessories	\$135

Wide selection of GE/Ericsson/Motorola accessories
NH COMMUNICATIONS CO.
 P.O. Box 5342 • Manchester, NH 03108-5342
Tel: 603-668-3004

CIRCLE (120) ON FAST FACT CARD

All CCII
Labels

WHITE, ORANGE, GREEN AND RED
BUTTONS AVAILABLE

\$12.50 ea

CCII PROGRAMING AVAILABLE

ORDERS SHIPPED IN 14 DAYS

NORTHEASTERN
Communications, Inc.

Waterbury, CT (203) 575-9008

We buy used Motorola radios

ACCES 514-735-2424

RENTALS

MOTOROLA RADIO RENTALS

- HT1000, GP300, P200
- Intrinsically Safe
- Full Line of Radio Accessories
- Mobiles & Repeaters
- 24-Hour Service
- Dealer Inquiries Invited

1-800-283-COMM

EVENT RENTAL COMM., INC.

e-mail: eventcomm@aol.com

Wireless Rentals...

Expand Your Rental Pool!

- Motorola two-way radios • Nextel phones
- NEW!! Globalstar satellite phones
- Cellular phones and pagers
- Rent by the day, week or month
- Dealers welcome

DAY
WIRELESS SYSTEMS

What wireless wonder can we perform for you?

Call 800-554-0402 today.

CIRCLE (121) ON FAST FACT CARD

TOWER SPACE



CHECK THE FACTS THEN
CALL THE BEST!

Chicago Tower Leasing Corp

Environmentally controlled
equipment enclosures, back-up power,
RF engineered sites. Secure.

Premiere sites in Metro Chicago Area—choice of
Federal, State, Govt. & all Class A Systems.

STAN STANN
105 MURPHY LAKE ROAD
PARK RIDGE, IL 60068

(847)823-7713

**Classified
Advertising
Works!**

**MOSS MOTOROLA
RADIO
RENTALS**

Ten years of great
service to you!

Call for a quote.
We'll make your next
project affordable.

Garth Moss
www.mosscom.com
800-822-MOSS





Cardinal Electronics, Inc.

SERVICE MONITOR Repair & Calibration

Exclusive Monitor repair since 1973
NIST TRACEABLE NEW LOWER RATES
Visit our Website: cardinalelec.com



1631 N. Evergreen Ave. Arlington Heights, IL 60004
Ph. (847) 797-7820 Fax (847) 870-0342

Loudoun Communications Inc.

Communications Systems

REPAIR DEPOT

QUALITY SERVICE ON MICROPROCESSOR-BASED
MOBILES, PORTABLES AND CONTROL HEADS.
SURFACE MOUNT REPAIR. MOST REPAIRS \$75 PLUS PARTS.
FREE ESTIMATES.

Warranty Service Available On:
Ericsson/G.E. • Kenwood

585 Factory Shoals Rd.
Austell, Ga. 30168

770-948-9566

Cushman / IFR / Motorola / Wavetek

Get Your Test Equipment Needs
From Service Professionals.
We Buy & Sell Service Monitors.

Communication Service Monitor
Repair & Calibration Specialists

NS Electronics Service, Inc.
3610 Dekalb Technology Pkwy
Suite 110/111
Atlanta, GA 30340
Phone: 770-451-3264
Fax: 770-458-8785



www.nselectronics.com

66th APCO Conference & Exposition August 13 - 17, 2000

Hynes Convention Center • Boston, MA

For information, contact:

APCO International, Inc. World Headquarters

2040 S. Ridgewood Avenue
South Daytona, FL 32119-8437

apco@apco911.org

904.322.2500

888.APCO.9-1-1 • 888.272.6911

Fax: 904.322.2501

COMPUTER SOFTWARE

MEASURE SIGNAL COVERAGE!

- Automate field measurements and drive-tests.
- Create signal contours from measured data.
- Compatible with HP, IFR, Z Technology and other instruments.
- Use your NMEA or TSIP GPS receiver.
- Automatically records signal



STI-9400 Software
\$4,995.00 Includes
Street Map Data for USA

FREE DEMONSTRATION CD

Toll Free: (877) 848-8500 Fax: (503) 848-8534

Email: sales@surveytech.com

Survey Technologies, Inc.

"Geographic Signal Coverage At Your Fingertips"

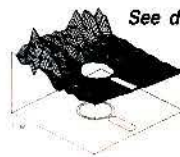
www.surveytech.com

CIRCLE (123) ON FAST FACT CARD



**To Your RF Coverage
and Site Management
Problems . . .
On your own PC!**

For either microwave links or area coverage, our
Terrain Analysis Package (TAP)TM software helps
you find system design solutions in-house.



See details and download demo from our web site!

SOFTWRIGHT, LLC

1010 So. JOLIET ST, SUITE 204

AURORA, CO 80012-3150 USA

TEL. (303) 344-5486 • FAX: (303) 344-2811

www.softwright.com

e-mail: sales@softwright.com

CIRCLE (124) ON FAST FACT CARD



DANGER!

Advertise in MRT CLASSIFIEDS, or
get eaten by the competition!

Call 1-800-347-9375 today!

REPAIR SERVICES



**Amps on
the fritz?**

Nothing we can't fix!

Lenbrook is the largest repair center for all amplifiers made by:

Milcom™ • Uniden™ • Powerwave™

Contact one of our offices to purchase parts or to have your amplifier repaired.

West 1-888-263-5335 East 1-888-750-2677
1-800-263-4633

www.lenbrook.com/pseries/

Lenbrook
COMMUNICATIONS
& ELECTRONICS

Under a franchise agreement with Lenbrook Corp.
Milcom, Uniden, and Powerwave are registered trademarks of their respective owners.

Advanced
COMMUNICATIONS
& ELECTRONICS, INC.

Quality Two-Way
Communications Equipment
Sales & Service

Specializing in:

- 2-Way Radio and Cellular Transmitter Amplifiers
- 2-Way Radio and Cellular Tower Top Amplifiers
- EDACS Equipment
- Custom Project & Equipment Modifications

78 Airpark Drive
Lynchburg, VA 24502-3757

Phone/Fax (804) 237-8255
Toll Free: 1-800-488-7908

www.advcommunicationsinc.com

**Want more information on
advertised products?
Use the Reader Service Card!**

TWO-WAY SERVICE

REPAIR/PROGRAMMING/TUNING
• PORTABLE/MOBILE/REPEATER/PWR AMPS
• COMBINERS/FILTERS/DUPLEXER
• MAXON WARRANTY CENTER
• SPECIAL PROJECTS & EQUIPMENT MODS
• QUICK TURN AROUND

T.A. RADIO COMMUNICATIONS INC
700 S JOHN RODES BLVD, SUITE C1
MELBOURNE, FL 32904
321-725-4824

E*MAIL: TAENT@AOL.COM

MOTOROLA \$49 Flat Rate
Plus Parts

PORTABLE & MOBILE REPAIR

- Quick Turn Around • Free Return Shipping
- Factory Trained & FCC Licensed Techs

ARCOM

800-567-5636
www.laker.net/arcom

11110 W Oakland Park Blvd, Suite 275, Sunrise, FL 33351



**Minitor II Pager
Repair Just \$32.50**
Price includes all
Parts and Labor

**5 Day turn time
90 Day Warranty**

Dealer Price

800-822-2180

1300 N FL Mango Rd #26
West Palm Beach, FL 33404

Water/Physical Damage and
housing parts not included



COMPUTER SOFTWARE

** WIRELESS SOFTWARE **

Save time designing, optimizing
and managing wireless radio
communication sites:

- Human Exposure to RF Emissions
- Intermodulation Interference Analysis
- Transmitter Spurious Output Analysis
- Transmitter Harmonic Output Analysis
- Transmitter Noise Analysis
- Receiver Desense Analysis
- IM Signal Level Analysis
- Report Integration with Microsoft Word
- Communications Site Design
- Site Management Database
- Equipment Maintenance and Inventory
- Interference/Exposure Analysis Services

**COMSITE™
PROFESSIONAL**

Douglas Integrated Software

CALL 800-845-0408 or 850-906-0748
<http://www.polaris.net/~douglas>

TRUNKING

**UHF
TRUNKING'S
MOST
POPULAR
LTR®
CONTROLLER**



- CTCSS/DCS Capability
- Repeater Disable Function
for Co-channel Protection
- Easy interface and set-up with most repeaters
- Interconnect Model Available
- Allows conventional and trunking users
to share channels

Available Direct from the Manufacturer

TRIDENT
MICRO SYSTEMS

Buy Online at:
www.tridentms.com

Two Trident Drive, Arden, North Carolina 28704
(828) 684-7474 • (800) 798-7881 • Fax (828) 684-7874
sales@tridentms.com

CIRCLE (125) ON FAST FACT CARD

RENTAL MANAGEMENT

CRI's Rental Management software
will solve your radio & equipment
rental needs!

- Integrated Billing System
- Serialized & Non-SerIALIZED
- Sell Rented Items
- Many Standard Reports

cri computer
resources
inc.

(205)987-1523
www.criinc.com

CIRCLE (126) ON FAST FACT CARD

**MAXIMIZE YOUR COMPANY'S
EXPOSURE IN THE MARKETPLACE
BY TAKING ADVANTAGE OF REPRINTS!**

**CALL JENNY EISELE
FOR A QUOTE**

**PHONE (913)967-1966
FAX (913)967-1898**

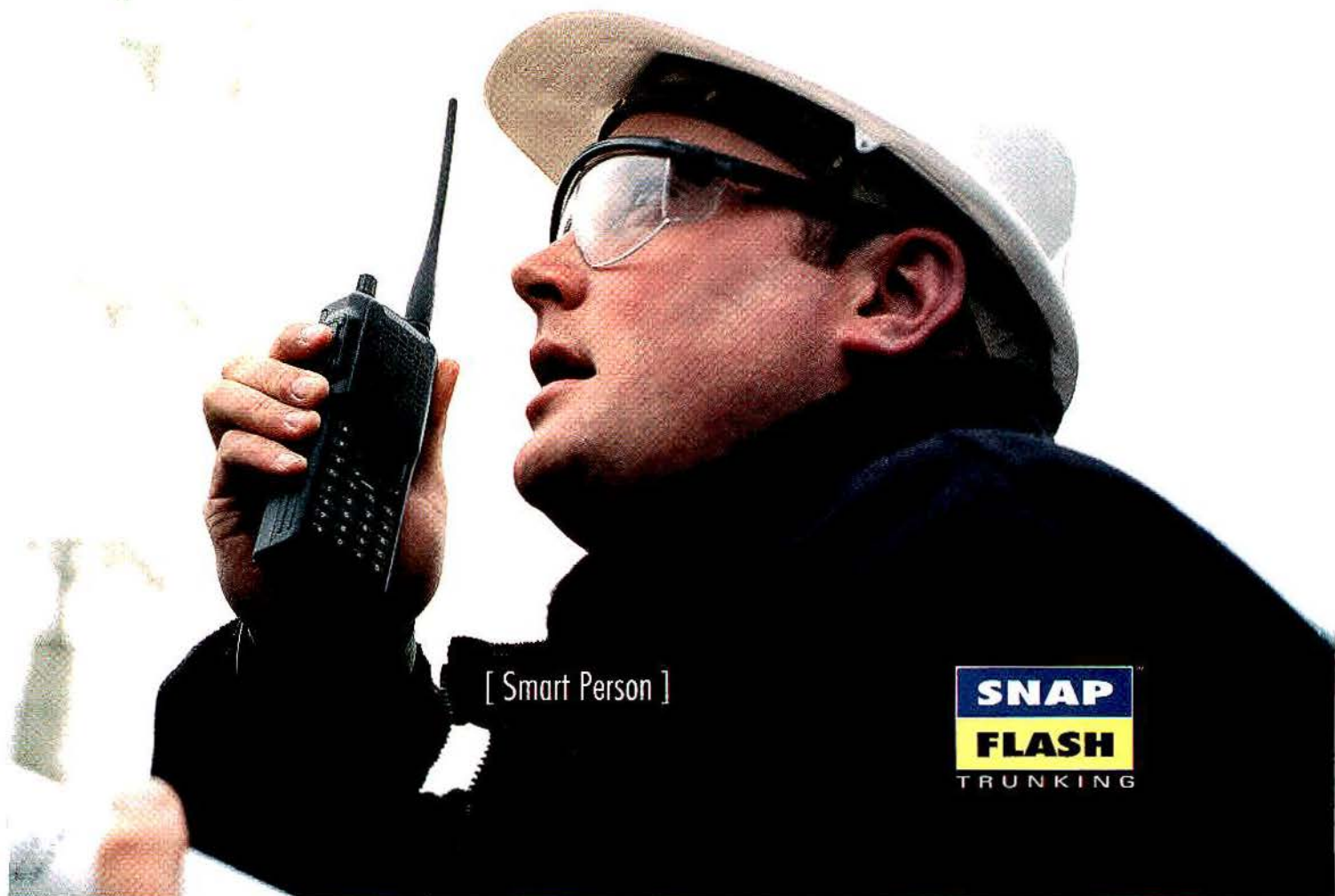


AD INDEX

Company	Page Number	Fast Fact Number	Advertiser Hotline	Company	Page Number	Fast Fact Number	Advertiser Hotline
Advanced Battery Systems, Inc.	46	37	800-634-8132	Modular Communications	15	14	818-764-1333
Advanced Receiver Research	66	52	860-485-0310	Motorola Test Equipment	21	22	800-422-4210
AeroComm, Inc.	37	29	201-227-0066	Narda/L3 Communications	30-31	64	631-231-1700
Air Comm	82	115	602-275-4505	New Hampshire Communications	85	120	603-668-3004
Air Comm	83	116	602-275-4505	Novatel Wireless, Inc.	23	24	877-BUY-CDPD
*Amrel Systems, Inc.	PS1	15	800-882-6735	Omnicon Electronics	68	55	860-928-0377
Andrew Corp.	17	19	800-255-1479	Open Sky	41	33	877-OPENSKY
Andrew Corp.	65	51	800-255-1479	Otto Communications	73	60	847-428-7171
Anritsu Company	33	27	800-ANR-ITSU	Paging & Wireless Service Center	14	13	800-822-2180
Antenex	79	106	800-323-3757	Peltor®	53	42	800-665-2942
The Antenna Specialists Co.	20	21	800-321-9977	Polaris Industries	80	108	404-872-0722
a division of Allen Telecom				Premier Communications	71	57	714-257-0300
Astron Corp.	7	7	949-458-7277	*Printrak® International, Inc.	PS7	17	800-666-2707
Berkeley Varitronics	11	10	732-548-3737	Quantum Radionics	76	101	703-884-8548
David Clark Co., Inc.	40	32	800-900-3434	Racal Communications, Inc.	19	20	800-258-4420
Communications Specialists	BC	3	800-854-0547	Radio Frequency Systems	39	31	877-RFS-WORLD
Comnet-Ericsson	48-49	39	800-431-2345	RCC Consultants	75	100	732-404-2400
Computer Resources, Inc.	87	126	205-987-1523	RCW Distributing	81	110	612-808-0069
Connect Systems, Inc.	64	50	800-545-1349	RF Imaging & Communications	84	119	925-229-2034
CPI Communications Inc.	59	59	800-869-9128	Ritron Inc.	52	41	800-USA-1USA
Crescend Technologies	74	61	800-872-6233	Sacramento Comm. Surplus	79	105	916-782-1225
Daniels Electronics	24	25	800-664-4066	Shure, Inc.	13	11	800-25-SHURE
Day Wireless	85	121	503-659-1240	Simulcast Solutions	81	112	716-223-4927
Diversified Electronics	63	49	800-646-7278	Sinclair Technologies, Inc.	38	30	800-288-2763
DLC	61	47	800-421-3536	Softwright	86	124	303-344-5486
Doppler Systems, Inc.	68	54	480-488-9755	Sonik	77	102	760-752-1011
Duracomm Corp.	56	44	800-467-6741	Southwest Windpower	56	45	520-779-9463
EDX Engineering, Inc.	57	46	541-345-0019	Survey Technologies, Inc.	22	23	503-848-8500
E.F. Johnson	1	4	800-621-2945	Survey Technologies, Inc.	86	123	503-848-8500
EPCOM	84	118	915-533-5119	Telepath	84	117	510-656-5600
EML	78	103	615-771-2560	Telepoint, Inc.	62	48	310-652-3666
EnviroGuard	32	67	800-975-4421	Telewave, Inc.	5	6	800-331-3396
*ESE	PS8	18	310-322-8127	Thunder Eagle	59	53	888-877-8022
Fiplex Communications, Inc.	67	65	305-884-8991	Times Microwave Systems	45	36	203-949-8400
Globe Electric	78	104	281-933-0909	Times Microwave Systems	47	38	203-949-8400
GTE Corporation	55	43	888-GTE-9134	TPL Communications, Inc.	42	34	323-256-3000
Hark Towers	82	113	843-764-1560	Transcript International	43	35	800-276-8878
Holzberg Communications, Inc.	82	114	973-389-9600	Trident Micro Systems	36	28	800-798-7881
Hutton Communications	69	56	877-648-8866	Trident Micro Systems	87	125	800-798-7881
ICOM America	IBC	2	425-450-6088	TX RX Systems Inc.	3	5	716-549-4700
I-Com Industry, Inc.	74	62	703-707-9094	Vega/Telex Signaling Products	10	9	800-752-7560
IDA Corporation	24	26	800-627-4432	VERTEX/YAESU USA	IFC	1	562-404-2700
*IFR Systems	PS5	16	800-835-2352	Vocom Products	81	109	800-872-6233
ITA	72	63	703-528-5115	WETEC	80	107	901-286-6275
JPS Communications	14	12	919-790-1011	W & W Manufacturing	9	8	800-221-0732
Klein Electronics	81	111	760-781-3232	Zetron Inc.	51	40	425-820-6363
Link Communications	25	66	406-245-5002				
Maxrad, Inc.	70	58	800-323-9122				

*Denotes partial run; advertiser may not appear in all issues.

FOR PEOPLE WHO MAKE SMART CHOICES...



[Smart Person]

SNAP
FLASH
TRUNKING



[Optional LTR® Trunking]

Looking for a brand name to trust? Take a look at ICOM!

ICOM radio products are well known for state of the art technology, ease of operation and rugged reliability. ICOM offers you exceptional personal service from a support team that many believe is the best in business. Add it all up and you'll see why ICOM radios are for people who make smart choices.

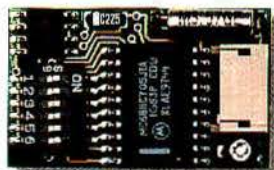
We are the radio company for you.

For free literature, call us at 425-450-6088.


ICOM
www.icomamerica.com

©2000 ICOM America, Inc. 2380 116th Ave. NE, Bellevue, WA 98004 • 425-454-8155 • The Icom logo is a registered trademark of ICOM, Inc. • LTR® is a registered trademark of EF Johnson Company • LMSNAPMRT600

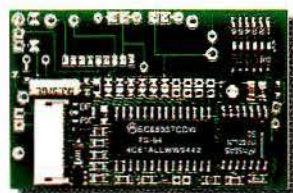
Circle (2) on Fast Fact Card



SS-64 \$28.95
Microminiature DIP Switch Programmable CTCSS Encoder.
Includes 64 tones from 33.0 to 254.1 Hz.
.66" x 1.08" x .21"



TS-64 \$54.95
Sub-miniature Programmable CTCSS Encoder-Decoder.
Includes 64 tones from 33.0 to 254.1 Hz.
.78" x 1.70" x .25"



TS-64DS \$57.95
DIP Switch Programmable CTCSS Encoder-Decoder.
Includes 64 tones from 33.0 to 254.1 Hz.
1.25" x 2.0" x .30"



ANI-1/\$39.95 **ANI-2/\$299.95**
Automatic Number Identification System
ANI-1 Encoder - 1.13" x .66" x .22"
ANI-2 Station Decoder - 5.4" x 5.8" x 1.4"



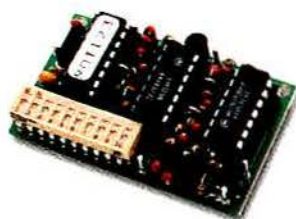
ID-8 \$69.95
Automatic Morse Station Identifier. Meets all FCC
ID Requirements. Fully field programmable
with included keypad. 1.85" x 1.12" x .35"



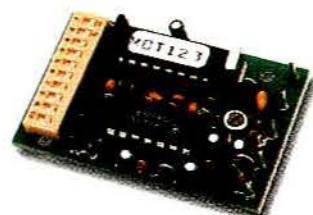
TP-3200 \$279.95
Full Featured Shared Repeater Tone Panel with ALL 157
CTCSS/DCS codes. In Desktop or Rack Mount versions.



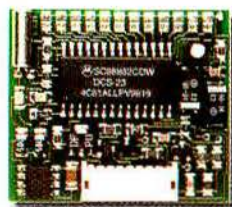
PE-1000 \$224.95
Desktop Paging Encoder. Two-Tone Sequential,
other formats available. 7.5" x 7.8" x 2.7"



SD-1000 \$59.95
Two-Tone Sequential Decoder. Programmable unit
provides switched outputs from Two-Tone paging calls.
1.25" x 2.0" x .4"



PE-2P \$54.95
Two-Tone Sequential Encoder. Sub-assembly mounts
inside radio or other enclosure. Multiple call capability.
1.25" x 2.0" x .4"



DCS-23 \$59.95
Digital Coded Squelch Encoder-Decoder. Programmable
to all 106 DCS codes. 1.36" x 1.18" x .25"



TE-64D \$129.90
Multi-Purpose CTCSS/Burst Tone Encoder w/LED Display.
Great for the Benchtop. 5.25" x 3.3" x 1.7"



FILTERS
Call us for the lowest cost, 12.5kHz channel spacing,
exact replacement, crystal and ceramic IF filters for
Part 90 Relicensing.

- Same reliable and cost effective products you have known and trusted for 30 years!
- Full FIVE YEAR WARRANTY on all products
- "INFO FAX" with 24 hour information
- Same day shipping on most orders
- Toll free 800 numbers for both voice and FAX



COMMUNICATIONS SPECIALISTS, INC.

426 WEST TAFT AVENUE • ORANGE, CA 92865-4296

(714) 998-3021 • FAX (714) 974-3420

ENTIRE U.S.A. (800) 854-0547 • FAX (800) 850-0547



Outside USA or Canada: Jesscom International, 30, 17th Avenue, San Mateo, CA 94402 USA • Phone (650) 574-1421 • FAX (650) 574-5297

See our complete
catalog and product
descriptions on our
web site at

www.com-spec.com

Circle (3) on Fast Fact Card